Bulletin 01.2 English summary

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01 Meeting of 13 January - the first in the new millennium Secretariat

There were seventeen members present. The president had a few announcements: an editorial board is to be formed, meetings will have a theme, the internet site should be more formally established (help wanted), Chronomium was opened. Members also discussed various items: rope sundials, the Morrison astrolabia (see also www.astrolabes.org), and a prototype sundial featuring a small glass globe projecting a narrow beam of light, among other things.

The theme was: 'sundials and computers'. Members Sassenburg and De Vries discusssed such subjects as: Information on the web, E-mail contacts (and Roth's mailing list), Computing power and sundial software (ZW2000 is now available in Chinese, courtesy of Kwang Wang Cheung), Archiving (and the NASS cd's), and Extra's with paper books (such as the Faszination Sonnenuhr cd with 150 sundial photos).

02 Meeting of 17 March Secretariat

Twelve members attended. Annual official part: Anniversary committee (the Society exists twenty-five years in 2003), excursion (Ootmarsum and near the German border) organised by Holman; plus the usual society formals. In the informal part, Hugenholtz showed the plastic laminated EoT/Dec cards he made. De Rijk investigates into the use of a (wire) frame cube for a sundial. De Vries shows photos of the Province sundials, and a card dial for the IX-th hour. Sasbrink has some sundials on the Wilhelmshaven (Germany) show. Mrs. Schoorel inquires after the possibility of a sundial on a new church building in Vlissingen, particularly on a cylindrical wall; perhaps even a "hat" dial.

04 Members, and various notes Secretariat

One new member, three address changes (please note Arbeitsgruppe Sonnenuhren of Austria), one deceased.

René R.J. Rohr passed away December 2000. He was 96. He has been a member for a long time, and has published many interesting articles in our Bulletin (see p1) as well as many books, among which the standard work "Die Sonnenuhr" which appeared in many translations.

The "Chronos" Foundation of Ootmarsum opened the Chronomium in that place on 20 December 2000. Chronomium is a permanent exhibition on all aspects of time. See www.chronos.nl.

The Austrian meeting is in St. Georgen on 7 and 8 September 2001.

Legal Time in The Netherlands: see www.phys.uu.nl/~vangent/wettijd/wettijd.htm , for an interesting paper by Robert van Gent.

Museums on the net: Four important museums have opened www.mhs.ox.ac.uk/epact with information on 520 instruments from the Middle Ages until 1600.

06 An armillary sphere for every Province Secretariat

Eugene Roebroeck, in co-operation with the artist Wybe Westra, is creating a series of armillary sundials. Eventually there should be one (and not more than one) in each Province. The project is near halfway.

The dials are reduced to the bare minimum for this type: gnomon, equator band and support, with only a nodus added. The equator band is not (part) circular, but opened out towards the ends. Materials are bronze, brass and stainless steel. Only 6, 12 and 18 (apparent) are marked. Dimensions are (w, h) 65 x 80cm, or about 26" x 31". The sundials are meant for private areas, and may not always be visible from the public road.

07 Babylonian hour lines H.W. van der Wijck

Babylonian hour lines count 24 equal hours from sunrise to sunrise. Searching the literature, Van der Wijck found three methods for the construction of Babylonian lines on a horizontal dial.

Van Rijn, in B.VI p236 says, "it is helpful to imagine that the great circle representing the horizon on the celestial globe is rotated about the polar axis from the moment of sunrise". Keeping the angle between the gyrating once-horizontal plane and the polar axis constant, say with a giant cardboard triangle, makes this a little easier to visualise. [I think that the cone-sundial for Italian and Babylonian hour lines does exactly this]

This did not provide an actual construction, so the author drew lines between the appropriate points on the winter and summer declination lines. Alas! Drecker dismisses this as "Unnatural patch-work, not fit to disclose the essence of these Lines". Follows his own method, incomprehensible in its 1926 German conciseness.

After some study to find out more about this 'essence', the author consulted Rohr (Die Sonnenuhr) where he found a much simpler construction. In order to understand it, he proved Rohr's method using new figures.

Having mastered the Babylonian essence satisfactorily, Van der Wijck turned again to Drecker. He has to admit that not all became clear to him yet. Rohr's construction, on the other hand, he found quit useable.
Turning next to vertical dials, there were some unexpected new problems. Rohr starts at once with declining dials, and with a construction that, with due respect, Drecker would also find unnatural. Besides, the author wanted a south-facing dial and not a declining one. Trying the construction anyway, the result looked somewhat bizarre. Calculations with the rotating co-ordinate system yielded correct results, except for hour B.9 at dec -23.5° (5:15), where the computed point was not under the horizon, but on the intersection of the corresponding hour line and the extended declination curve. That is a consequence of the math used; the effective part of the Babylonian line is correct, after all. There is another graphical method in Rohr, but it would not work for φ=52° - it was only when the author actually manufactured a paper cone with an apex of 2φ that he found out it was over 90°. He let it rest at that, because he already had a method for both horizontal and vertical dials, and had already spent much time on the matter. In a footnote, he recognises Borsje for his help with the article.

17 Renovation of the Brou dial of St.Johns Cemetery, Utrecht J.A.F. de Rijk
The Dutch Sundial Society presented the plans for this sundial to the City of Utrecht at the occasion of the Society's first lustrum [The Society was founded 11 March 1978. The sundial was completed 6 and 7 October 1983; see Bulletin #18, page 923]. After all those years, the dial was in bad shape. With the coming of a new bus strip, the City removed the sundial, luckily only to restore it later. The builder had been instructed to measure everything carefully, but was pleasantly surprised on receiving the original plans from De Rijk.

18 Another sunpicture A.J.M. van den Beld
The author investigated an aerial photograph of Deventer, marked "10 April 1945". On this date the shadows, which have a direction of between 303° and 304.5°, would indicate about 10:33 to 10:40 DST. However, the bridge visible in the picture was blown up at 9:07 dst that day, and the picture must have been taken earlier. Using a yardstick and camera, Van den Beld measured the height of six buildings that showed a measurable shadow in the "10 April" photograph. Calculations showed that the altitude of the sun was between 21° and 24°. Azimuth and altitude range, together with Meeus' Astronomical Algorithms, work out to the picture having been taking on a date between 15 and 23 March, at a time between 10:18 and 10:27 DST, or about three weeks prior to the liberation of Deventer.

19 A shed in perspective A.J.M. van den Beld
The "sunpicture" item in B00.3.27 finished with a puzzle: from where are the two sides of a shed seen under equal angles? The set of all points from which one sees *one* side under a *specific* angle forms a circle, and so we are looking for the intersections of the matching circles for all angles. These points form a third order curve, shown in the figure. Its asymptote has a directional coefficient equal to the ratio of the actual sides.

20 The Mercator Projection Mystery - revisited R.J. Vinck
Mercator wanted a conformal mapping, with straight and equidistant meridians at right angles to the parallels. A loxodrome, intersecting all meridians under equal angles, would then itself be a straight line.
It was common knowledge that the ratio of an arc on the equator and the corresponding arc on a parallel equals the secant (1/cos) of the parallel. Multiplying the scale in the direction of the meridians would solve the problem, but Mr. Vinck does not think Mercator did that using the method described in B01.1.
Mathematician Edward Wright, in "Certain Errors in Navigation" (1599), thinks that Mercator summed the secants for every degree, so accumulating an error of 12' on 45° latitude [checking $\Sigma (\cos x)^{-1}$ for 0..44° I did get the same 12']. The drawing explains the method: construct an angle equal to the latitude and circle AC to AC' to find the next parallel. AC = AB sec φ, of course.
Wright proceeded to compile tables using summation for every minute of arc, which should provide sufficient accuracy for navigational purposes. The present day solution using calculus is $\int d\varphi/\cos\varphi = \ln(\tan(\pi/4 + \varphi/2))$.
Using degrees for input, minutes of arc for output and $\log_{10}$ instead of ln, Vinck arrives at $7915.71 \log(\tan(45^\circ+\varphi/2))$.
Wright was the first to recognise the mathematical nature of the increasing latitudes, an insight Mercator possibly lacked. This would mean that the Mercator Projection is not geometrical but conventional, or calculated, in type. Present day Mercator maps still use the equation, but corrected for the oblateness of the earth.

22 Walking sundial A.G.M. Bron
Mr. Bron is well known for his solar-powered mechanical sundials. His latest invention is a sun-pointer. Mounted with three wheels, it rotates itself about in its entirety until the hand points at the sun. A smaller pointer, fitted to the chassis, indicates time as it moves over a circle with equatorial hour lines.
Changing the orientation of the wheels, the sunpointer no longer rotates only about its axis, but travels along a circle of much larger radius, giving far greater precision in reading.

23 Card dial for a specific hour F.J. de Vries

This card dial was found in Italy, between the pages of an old book. It is difficult to tell its age. Intended for use at lat.45, it indicates the IX-th "planetary" or antique hour. The month lines show that the Gregorian calendar was in use: shadow lengths are about equal 21 March and 21 September. In the Julian system, there would have been a clear difference. It remains unclear what the special meaning of this Horam Nonam Planetarium was.

24 The forgotten sundial of Besançon F.W. Maes

Maes is an aficionado of analemmatic sundials and even has his own in the garden. On his safari list (see p.24) were several dials of this type, and he visited all of them except Montpellier, which was too far.

The French catalogue mentioned two analemmatic dials in Besançon. One is in a schoolyard, and one near the Observatory, and in bad shape. A friendly lady at the observatory explained, after some convincing, were it had been: near the parking lot across the road, but "nothing was left - really nothing at all".

The author, naturally, went there anyway and found the dial clearly visible, albeit somewhat worse for wear. It is a closed ellipse, 6m (20 ft) long, with 24 hour points running from 0 to 23. Maes used pineapples to mark them in the photograph.

Remarkably, "0" is in the north, offsetting the dial 12 hours from the more usual twice I to XII points on other full-ellipse analemmatics. Apparently, this is in accordance with the practice among astronomers, until 1925, to start the day at noon. That way the date did not change overnight, clearly useful for logging observations.

Dr. Dennis Savoye says the dial dates from 1902 and is by L.J. Gruey, then president of the Observatory. In his article, that Dr. Savoye graciously sent Maes, Gruey proves the analemmatic using differential calculus, then a novel method. Of the actual sundial, the article shows only a plan, but that does have the 0-23 scale.

This is the third oldest analemmatic dial in the world, after Brou and Dijon, but it is found nowhere in literature. It is a forgotten sundial. It could celebrate its centennial next year, were it not for the deplorable state it is in. Maes suggested it to the Observatory, but regrettably, their priorities lie elsewhere, he was told. In this respect, also the Besançon dial is truly forgotten.

26 The self-orienting sundial (corrected version) A. van der Hoeven

By accident, the draft version of the article was printed in last Bulletin. This is the release edit. Its summary would read the same as that of the draft.

28 Sundials in The Netherlands W. Coenen

Ommen 1. Eerde Castle, 12 May 2000. Horizontal, round brass dial face 3mm (1/8") thick, diameter 30cm (1') on Bentheim sandstone pedestal; Roman numerals V-VIII (5-20). Architects Vos, Ten Broek, Van Wely of Velp; calculations by the Dutch Sundial Society. Private grounds.

Papendrecht 1. See picture. Member Borsje reports: An opened-out and stretched armillosphere. Total height 90cm (3'), white hour band 10cm (4") wide on satin black metal. Bronze, Roman numerals 7-19. Pisces and Cancer decorations. By Romanti of Bleskensgraaf.

It is doubtful if the dial is placed correctly, as help from Borsje was refused. To quote the owner, "12 o'clock is 12 o'clock. It's not exactly rocket science".

29 Literature 1395..1405 D. Verschuuren and A. van der Hoeven

Correction: the Zwei-Ebenen dial by Wetzel (**1392.6**) is not self-orienting, as the text could have us believe.

Other picks from the multitude of interesting items:

1395 three new books, reviewed by A. vd. Hoeven. **1395.1** Faszination Sonnenuhr by Zenkert, third edition. This general knowledge book is excellent for the novice (see p.29 footer for ordering information). **1395.2** Le Cadran Solaire, principe et realisation, by Verplocgh. Apart from technical information, historical is also presented, some of it new to the reviewer. **1395.3** Cadrans Solaires, les comprendre et les construire (Understanding and making Sundials) by Tardy. A more graphical-mathematical approach, assuming some knowledge in the field. Tardy claims "make a sundial in under half an hour using only a programmable calculator". You can do this is you read French and have a grip on the math. **1397** Sundials in the Franker Planetarium. The Franeker Planetarium, in the Dutch province of Friesland, was completed in 1780 and is still working correctly in all details. The Sundial Society staged an exhibition of some 70 special sundials, "from matchbox size to 50x60cm, some shaped like a book, others a ship or a musical instrument", according to the newspaper Franeker Daily. **1399.3** La Busca de Paper: Gnomonica i Numismàtica, by Vallhonrat. A 1776 half-dollar bill from Philadelphia, with a hand-written serial number, shows the sun and a sundial, along with the words 'Fugio' ("I flee") and 'Mind your business'. **1400.4** Zonnetijdingen: Two diagrams for horizontal sundials, by Vinck. Designs made easy and quick, without calculations. The second (Foster-) diagram reads directly the angle between an hour line and the noon line or substyle. **1402.1** The Compendium: Sundials and Mathematical Surfaces. On the statement about spherical trigonometry getting past its sell-by date, our reviewers have this to say: "(This is) obviously written by a computer fanatic, and the results look more like pernicious fish-traps than like sundials." **1404.2** Analema: El Astrolabio de rojas y la Acafea de Azarquiel, by Valdés. References our seldom found to early Spanish and Arabic gnomonics, where for example the Rojas astrolabe has its origin. This article is about the Orontio Finé

and Rojas astrolabes, other publications about these instruments, and a method of reading time that does not need resetting the astrolabe. **1404.3** ibid.: Relox español de Hugo Helt, by Valdés. Friesland-born Helt lived and worked in Spain, where he worked, with others, on some Casa de Rojas documents. The sixth book, description and use of the Rojas Astrolabe, is really by Helt. Of another work, on the "Spanish Clock", the few remaining copies lost the drawings. This article attempts to reconstruct a possible Spanish Clock.

35 On True Christianity, by Johann Arndt D. Verschuuren
This book by the protestant mystic Arndt explains how he feels Christianity should be lived. The three emblemata reproduced here use sundials to illustrate the point. The book is in the monastery of St.Agatha.

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Space-age sundials help satellites look on the bright side

A COUPLE of sundials is all it takes to ensure that the solar panels of small satellites are always pointing at the Sun. Scientists at NASA's Jet Propulsion Laboratory in Pasadena, California, have shown that sensors working on the sundial principle will keep a satellite's solar panels working at maximum efficiency.

Satellites that weigh less than 10 kilograms, known as "nanosatellites", cannot carry huge on-board power supplies, says Richard Blomquist, who works on nanosatellites at Carnegie Mellon University in Pittsburgh. "They largely depend on solar power, so it's extremely important they know where the Sun is," he says.

To build the satellite's sundials, Carl Christian Liebe and Sohrab Mobasser took a 0.5-centimetre-square wafer of silicon and drilled hundreds of holes in it. They fixed another silicon sheet containing a grid of light-sensitive charge-coupled devices 0.75 millimetres beneath it. "The idea is that depending on where the Sun is, as it hits the top wafer it'll cast a shadow on the CCD," says Liebe. "From where the shadow falls, you can work out where the Sun is."

Liebe tested the device in a room fitted with a "heliostat" in its roof, a device that directs a beam of sunlight down into the room below. By moving the sensor and monitoring the image on the light-sensitive wafer, Liebe was able to calculate the angle of the Sun to within a few minutes of a degree.

"You're absolutely going to need something like this," says Blomquist. But he says that nanosatellites will need more than one sensor. "If your satellite takes a tumble, you can't risk the sensor ending up on the wrong side of the satellite," he says. Ian Sample

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