Contents of Bulletin nr. 90, 06.1 R. Hooijenga

After Jelte Eises died, his son Eise dedicated a poem to him. It is on the gravestone and ends in a curious riddle: “His age when he died, added to that year, makes 1854 $^{204}/_{365}$; while that year, multiplied with ¼ of his total years, makes 31120 $^{292849}/_{532900}$”.

This boils down to a quadratic equation. An elegant solution (1928), due to R. Lonneman, uses auxiliary variables p and q; see original text. Jelte was born 25 January 1715 and died 24 October 1784, 69 years and 272 days old.
All entries had the correct age, and agreed on day and month of birth and death, but not on the year – some had 1716 and 1785, reasoning that, for example, 1784 + 297/365 should be taken as to mean 297 days past the end of the year 1784.
To make matters worse, even contemporaries of Jelte Eises do not agree. Van Swinden and Eekhoff say 1785, while Havinga says 1784, and ‘Eekhoff errs”.
Records show that Jelte was baptized 2 January 1716, which would rule out 25 January 1716 as day of birth. And Eise Eisinga mentions the dates in the arithmetic book he wrote when he was 15 or 16 years old.

Eise Eisinga died 27 August 1828, 84 years old. Buried in the same grave, he received no epitaph – his son had unfortunately died as early as 1809, just 34 years of age. Unhappy with this, the Frisian Fellowship placed a memorial plaque on the church wall, both next to the church entrance and to the grave.

This highly technical and mathematical article leans heavily on Fred Sawyer’s contribution, “ A Bipolar Azimuthal Equant Sundial”, to which I must refer. Fer concludes with a no-calculations drawing recipe. L and R in the original text signify ‘see left figure’ and ‘see right figure’, respectively:

1. Draw an analemmatic sundial, including foci, for local apparent solar time. 2. Choose a random point on the meridian. 3. Draw, from that point, a fan of hour lines spaced fifteen degrees. 4. Choose a declination and draw the Lambert circle. Its intersections with the ellipse are the times of sunrise and sunset. 5. Draw azimuth lines for the hours and for sunrise (we need this last for the horizon). 6. Shift the hour line fan to the centre of the analemmatic dial. This is also where the gnomon foot will be. 7. Determine the intersections of the azimuth lines with the corresponding hour lines. 8. Calculate the hour angle of sunrise and, allowing for *k*, draw that hour line into the hour line pattern. Designate its intersection with the sunrise azimuth line as the end point of the declination line. This is also a point of the horizon. 9. Draw the declination line as a smooth curve through the intersections of azimuth lines with corresponding hour lines. 10. Repeat 4..9 for every desired declination line. 11. Finally, draw the horizon as a smooth curve through the end points from 8.

A lot of work, but fortunately, you need only do one half. The other is the mirror image.

For an equatorial sundial with a clock face-type readout, a 2 to 1 transmission was needed between the rotating sight and the hour hand. Hans de Rijk wondered if one could be made using the theorem stating that in any circle, an inscribed angle is exactly half of the corresponding central angle. The mechanism here does exactly that.
The pins on the smaller disk slide in the grooves in the larger. The dashed circle is the one used in the theorem. The inscribed angle is marked with a single arc at M1, the corresponding central angle with a double arc at M2.
A pin takes over before the force on the other becomes too high. The whole mechanism works like clockwork, says the author.

Digital sundial: Genk nr. 8 F.W. Maes 26

Although we have learned to associate ‘digital’ with ‘electronic’, this sundial has nothing to do with that. But rather than presenting time in a continuously varying angle, it does so in discrete numerals – in digits. Fig. 2 shows its principle, using the rightmost digit, which reads either ‘0’ or ‘5’. Slits making up these numerals in the bottom pane are shown left and middle, but are actually interleaved, as shown right. These slits are illuminated through a regular pattern of slits in the top pane. As the sun moves, the slits for either numeral are illuminated in turn. – In fact, there are twelve pairs of digits, 00, 05, …, 55 for the right half of the dial. Likewise, there are twelve pairs, forming 1, 2, …, 12 for the left half.

We could simply call this a multiple polar dial, but that would be missing the point a bit – this dial is to a simple polar dial as a grand piano is to a plucked bowstring.
Because the slits are equidistant, there would be an error either side of noon. We need to linearize the arc tangent function, and this is done by inserting between the panes a medium of refractive index greater than one. Using Perspex (n=1.5), the error is a few minutes at most between as much as four hours either side of noon.

Worldwide, there are five Krotz-Scharstein digital sundials. Genk’s “first” beat Munich by four days. The others are in Cologne, Oak Bluff (MA), and Middlebury (VT).
Independently, Bob Kellog invented his own digital sundial around the same time. It has a ten-minute resolution and is linear within two hours of noon.

Another type of ‘digital’ sundial actually uses the fingers of the human hand. Fred Sawyer and Mario Arnaldi found several examples in literature. And Karen Deal Robinson uses her hands to emulate an equatorial ring dial.

More than just a sundial J. Borsje 32

In 1976 (other sources have 1974), Marinus Hagen made this sundial for his daughter Elly and her husband Nico Max. It is piano shaped, 55 cm x 47 cm (22” x 19”), and the style is a violin and bow. Elly is a piano teacher, Nico plays the violin.
There is a complement dial, 32 cm x 20 cm (12 ½” x 8”), made from the same sheet. Its style is a half arrow with sawn-out signs of Aquarius (for Elly) and Aries (Nico).

The piano dial has a declination of -49 or about south-east, the complement dial one of 131 or almost north-west. Perhaps it should be called a supplement dial.

Because Marinus Hagen was founder of *De Zonnewijzerkring*, this dial pair is rather special to all members. ‘When Chairman Dik de Groot asked me if I was willing to restore these sundials, my heart skipped a beat’, says Borsje.

The new Max home has a different orientation, but the piano dial is placed on a corner of the house so that it could retain its original declination (photograph).

Bi-gnomon sundials H.J. Hollander 36

Working from articles by Fred Sawyer and Fer de Vries, Hollander progressed to sundials that are comparable in design, but where four important restrictions in the Sawyer – de Vries dials are lifted:
1. *Any* combination of two locations is possible, even the same location.
2. *Any* orientation is permitted for either gnomon, even the same orientation.
3. *Any* attitude of the two gnomons is permitted – for instance, two gnomons having different ‘style heights’ and azimuths with respect to the dial face.
4. *Any* combination of time systems is possible; for example, standard time *without* the use of EOT loops.

In any case, the dial is read where the shadow of the gnomon in use intersects the declination curve for the actual date.

Hollander now develops two practical sundials:

- A sundial for winter and summer time (without EOT correction, or with EOT loops). There is a single set of numerals; the shadows of the two gnomons simply differ by one hour. The example shows a horizontal dial with vertical gnomons. A vertical decliner is also possible, for any wall azimuth.

- A sundial for legal standard winter (or summer) time without EOT loops furniture. One gnomon is for lengthening, the other for shortening days. In the drawing, crosses indicate their foot points, and they meet over the dial face at the circle. – The last drawing combines the patterns of the new dial and a nodus dial as a check. Red lines indicate declinations for which the date pairs have equal EOT.

Any ideas? F.W. Maes 43
The three photographs show lectern dials; one “proper”, the other with a sphere on top. According to Terpstra (1953), there was one quite like the second (Amsterdam 6, originally Oenkerk) by Overwijk house on the road from Doorn to Driebergen. Any information about it would be most welcome. – The fourth picture is a 1985 drawing by Hagen of a sundial in Wezep. It is not there now; a simple armillary sphere has taken its place. Again, any information please?

An English garden sundial M.J.J. Spruijt 44
A 15”, eleven pound bronze horizontal dial, marked Fraser of Bond St, London. Heraldic decoration shows a Moors head with head band over shield argent, chevron sable with touching claymores between three Moors heads erased proper. A sixteen point compass rose and a table for the equation of time. Very finely done engraving.

Leap second saved – for now H.W. vd. Wyck 47
The International Telecommunication Union met November 2005 on the possible abolition of the leap second. GPS and computer network providers would like to end the practice; astronomers and geometers want to keep the leap second. An agreement was not reached, and the next meeting will take place not before August 2006. By that time, the 23rd leap second will have been inserted.

Italian west dial A. Schoorel 47
This sundial uses small “clock-faces” to indicate the hours. Its location, on the Gulf of Genoa, may only be reached on foot – and after negotiating several steep stairs.

Sundials in The Netherlands A.G.M. Bron 48
Flevoland Almere 01. Equatorial dial, 1.5m (6’) high, pyramid base. ‘C’ in the meridian stands for the Cascade trade mark. The hour band is eagle wing shaped. Alignment is thirty-five degrees off.
North Holland Enkhuizen 01. A DIY analemma, or standard time noon mark, by V. Icke. Passers-by may drive a nail, marking the middle of the disk’s shadow, into the board at the instant the bells of Enkhuizen strike twelve (one PM in summer).
North Brabant Mierlo 01. Equatorial dial of Belgian stone and stainless steel, by C. Peters. Hour marks are holes in the disk. Allowance is made for style thickness.
South Holland Rotterdam 10. A 98 cm (39”) armillary sphere, Roman numerals VI-VI, on the Crooswijk cemetery.