Contents of Bulletin nr. 88, May 2005

R. Hooijenga

Kepler in Prague and Planet Mars Comenius Museum, Naarden 11
Kepler (1571-1630) worked in Prague from 1601 to 1612, where he discovered his famous three laws of planetary motion. The Kepler exhibition is part of the five-part "World View Network – Forming a View of the World" project, and was originally set up by the Prague National Technical Museum. On display are instruments of the period, publications, charts, and portraits of contemporaries. Because Kepler based his First Law on observations of Mars, that planet, and recent discoveries concerning it, will also be among the subjects of the exhibition.

Design contest, 10th anniversary Flemish society editor *Zonnetijdingen* 12
Ten years ago, the Zonnewijzerkring Vlaanderen was established in Rupelmonde, where the society still has its seat in a house on Mercator Square. Committee members Patric Oyen and Willy Leenders calculated the pattern for a (north-west declining vertical) sundial on its front. The design contest is all about the artistic side of the matter. The winner will see his design realised on the house. The contest closes 31 October 2005.

Schweitzer sundial displayed again F.W. Maes 16
The exhibition "Statues along Linge bank" runs from 9 May through 16 October 2005. The sundial by Beatrijs Schweitzer is one of the statues on display.

Garden Time Secretariat and others 17
The year 2006 is proclaimed the Dutch Year of the Garden. Dinkelland museums, united under the name of "Sigma M", are translating this theme into the project "Tijd in de tuin" (Garden Time). The project will involve a sundial room in the Natura Docet building, and a "Historic Zwolle Sun Calender" in the educational garden. De Zonnewijzerkring was asked to contribute manpower and fitting objects. The Society views this as an important initiative, with good opportunities for its members, and will therefore oblige. Contacts are members Hollander, Sasbrink and Bult.

Column of the Gods, Nijmegen F.J. de Vries 18
The press communiqué of the Town of Nijmegen was in the last Bulletin. The found fragments of the ancient Column are copied in bronze and will serve as a base for a new granite Column, ten meters tall, with a bronze tortoise on top. The new column will lean 17 degrees to the south. Its position is fixed due to plans for an underground parking. The gnomonic possibilities are thus limited.
The Zonnewijzerking designed a pattern for antique hours, to be executed in bronze slabs.

Did you know? Can you prove it? – part 5 A. van den Beld 20
Thus far, all solutions to Hans' original question use three-dimensional constructions. Van den Beld offers a two-dimensional proof. AM and AD are noon lines in the folded-down equatorial and the horizontal plane, respectively. MN and DN are corresponding hour lines. P and S are the intersections of these with diagonals AE and AC. If we prove the parallelism between PS and MAD, the correctness of Hans' hour line construction follows.
Assume PS is *not* necessarily parallel to MD. Call the wanted parallel PH. PH intersects AC in U, and DN in T. From known ratios for parallel lines, we find that HU=HT, so U and T must coincide, being on the same side of H. And because they are on different lines, they must be on the intersection of these lines, S. U, T and S are identical, and PS is parallel to MD and EC, proving Hans' construction.

'Did you know' and Ozanam; Ozanam and Timepiece F.J. de Vries 21
Hans' simple "Did you know?" in B04.1 brought about quite a lot. Later bulletins had various solutions, and mentioned Emerson's Theorem and dialling scales.
The usual dialling scale has an hour scale based on: $\tan t / (1 + \tan t)$, or $\sin t / (\sin t + \cos t)$. The same equation plays a role in a universal sundial by Jacques Ozanam. The picture shows a linear type for latitudes of 30 to 60 degrees. – Heinz Sigmund describes a clock that uses a vertical sundial pattern for its dial. A variable speed pointer runs counter-clockwise (!) from VI in the morning to VI in the evening. At the same time, a gnomon casts its shadow on the same dial, enabling one to set the clock. In principle, a good clock would show the equation of time, but in 1660, no one worried. – The same idea may be used with a vertical linear Ozanam dial. The pointer of a reverse-running 24 hour clock

moves the point of suspension for a plumb line. The shadow of the Ozanam dial gnomon should now show the same time as this moving vertical line. The Ozanam dial being universal, the combination should be useable over a large range of latitudes.

An electronic sun-pointer J. Appelman, L.C.F. Plessen 24
On the Amersfoort Station Square, you will find this impressive silver-coloured metal construction with the green arrow on top. The arrow always points to the sun, whatever the time of day. The sun pointer, finished 14 March 2000, consists of a plinth, a post with attached column, and the arrow. The post and column are driven from the plinth and describe a cone with an apex of twice 23.5° about the polar axis, at an average speed of 361° per 24h. The arrow rotates about the column, always square to it, and its relative average speed is 360° per (tropical) year. The article explains how this clever combination makes the arrow follow the sun. – A computer program, synchronised to the standard time signal from the Mainflingen transmitter, drives the stepper motors.

Cone sundial: sundial park Genk, nr. 9 F.W. Maes 30
This large (2.4m edge, 3.7m bottom diameter), canary-yellow cone, invented by Javier Moreno Bores of Spain, is a world first, and probably still the only one of its kind. The shadow of the cone shows Babylonian hours (yellow numerals) to its east, and Italian (blue numerals) to its west. The time systems show hours from sunrise and from sunset, respectively.
The axis of the cone is parallel to that of the earth. The cone lies on the horizontal plane; its apex is therefore twice the latitude. At sunrise, the sun is in the horizontal plane. This plane is tangent to the cone along the line on which it rests on the ground. The polar axis intersects the plane in the apex. One hour after sunrise, the sun plane has rotated through 15 degrees, and so has its tangent line with the cone. This is independent of declination and therefore of date. The shadow of the bottom of the cone would fall on the Babylonian 1-hour line, if it were provided. After 12 hours, the plane has rotated through 180 degrees, and is tangent to the upright south end of the cone. The 12-hour Babylonian line is thus exactly east-west. In summer, the sun would still be reasonably high; in winter, it would already have set by that time. – For Italian hours, the explanation is quite comparable, counting back from sunset. The Italian 12-hour line is thus also east-west. Take note, however, that the plane corresponding to Babylonian hours is not the same as the Italian one. The sun is always in two tangent planes, one on the bottom and one on top of the cone.
As it happens, Babylonian and Italian hour lines correspond to hour and half-hour lines of a horizontal dial. Fig. 6 shows why this is so. Of course, the numbering is different for the systems.
Because the entire conical surface is not necessary, variations are possible. The equatorial ring of the dial of fig. 7 could serve as a cone dial, using a pattern such as in fig. 8.
In closing, the author notes that the Genk cone dial hour lines are incorrect. At times, the difference amounts to as much as an hour and a half.

The Sundial (Maarten ‘t Hart) M. Hugenholtz 35
Central in the book is the idea that an occurrence is timed according to a sundial, and to a clock. What kind of sundial does the book describe? It is in the middle of the court, on pedestal in a grass plot, with white markers in the grass. Some pages on, it is a shiny sundial, and the shadow of a horizontal bar or rod falls on the dial face, which is exactly in the middle of the lawn. A little later, the tea lady says that one look out the window tells her the time. Still later, a visitor calls it a fine old equinoctial dial, and thinks it will be hard to see the shadow of the rod because the sunlight is not bright enough.
It appears we have here a metal, possibly brass, equatorial sundial on a pedestal. But such a dial does not have a horizontal gnomon, and no dial face or markers in the grass. And from a window, it would take a pair of binoculars to read it.

A sundial pedestal G.J. Sasbrink 36
A description for a cast concrete pedestal, with drawings. The base may be chipboard covered with plywood. Do not use chipboard or MDF for the moulds, but only wood and plywood. Oil (cooking oil is fine) the moulds thinly on the inside before casting.

Sawyers 'The Three Cardinals' F.J. de Vries 39
A short description of the new type of sundial developed by Fred Sawyer and presented in Compendium, vol. 12 nr. 1, March 2005. It is based on a chart projection developed in the early 20th century. The depicted The Three Cardinals sundial is an azimuth dial, but suitable for a south, east, and west wall, depending on where the gnomon is fixed to the dial face.

Never again a solar eclipse on Good Friday Hans van Maanen 40
Many people think that Easter falls on the fist Sunday after the first full moon after the start of spring. In 2005, that is the case, but not always. In 1903, for example, Easter day was on Sunday 12 April, and yet it was full moon. There was even an eclipse just after midnight; the best proof that the moon was, indeed, full. The determination of Easter uses a different moon, a different spring, and a few simple formulas– not astronomical observations or computations. The formulas were introduced in AD 532, and, with a few adaptations from 1582, are still correct.
Dionysius Exiguus advanced this rule: divide the year by 19, add 1 to the remainder. Multiply by 11, add 27, divide by 30, and subtract the remainder from 44. If the outcome is less than 21, we are a moon too early, so add 30. This is the date of the Easter full moon in March, so if it is over 31, we are in April, so subtract 31. The first Sunday after the Easter full moon is Easter Sunday.
The heavenly bodies did not adhere to this scheme. Both the sun (and thus the start of spring) and the moon (and its phases) went more and more out of pace. The sun by about a day per century, the moon a day per three centuries. Pope Gregrory XIII assembled a committee, and in 1582 the sun was moved ten days forward, the moon three, and things would be adjusted every century. We just had such a century year, so things should be clear for some time now. In Dionysius' formula, 27 is replaced with 18 and, to prevent accidents, if the outcome is 24 or 25, then 1 is added.
Christophorus Clavius, the driving force behind the papal committee, knew of course that the real moon and the church moon would not always coincide, and showed this in a comprehensive table. The proposal to follow the astronomical moon was rejected.
Another idea, to have Easter on a fixed day, was likewise rejected – if only because it allowed the possibility of having a solar eclipse on Good Friday.

Annual Rembrandt in Oude Kerk (Amsterdam) H.W. van der Wyck 41
From a regional newspaper interview with Herbert van Hasselt of the 'Oude Kerk' corporation: "Every year, on 9 March, at 8.39am, sunlight skims over the grave of Saskia of Uylenborgh, Rembrandt's wife. On that day only; a day later, the sun is too high."
Van Hasselt thinks this is no coincidence, and explains why Rembrandt chose this exact spot. These details are not in the Bulletin article.

Sundials in The Netherlands A.G.M. Bron 42
Overijssel – Moved: Sundial nr. 247 from Ootmarsum is now **Enschede 15**. The board was strengthened from 18 to 40mm, the dial was painted, and an hour ribbon and '1986' were added. – Moved: **Enschede 05** from Emmastraat 5 to a secret location. There is no photo of this cube dial.
Gelderland – Obituary notice? **Wijchen 01**, to make room for a facelift of the Zuiderpoort shopping mall. The AVC soccer club president Frans Derks would like the sundial by his fields, but will expect the local authority to help him meet the cost – and the powder blue would have to change into green.
South Holland – **Wassenaar 05**. A splendid old pedestal with sundials on all four sides of the plinth, possibly 1725-1750. The armillary sphere on top does not seem to be original. One would expect a more elaborate model, or perhaps a horizontal dial was originally on this pedestal.
Zeeland – **Vlissingen 06**. Analemmatic terrace sundial by Lidi Schoorel. See also B03.2, p.17.
North Brabant – **Asten 03**. – Star of David sundial by Dees Verschuuren. Shadows of the edges, cast on the sides, indicate time. To accommodate all declinations of the sun, the star is 10cm thick. The star rotates to set the sundial to standard or summer time.

The Flemish present to the Zonnewijzerkring P.J.K. Louwman 55
Jan de Graeve presents the magnificent book *A Catalogue Raisonné of Scientific Instruments*.. to chairman Dik de Groot. The book describes ninety instruments, such as famous astrolabia, by Louvain master instrument makers like Gerardus Mercator and Gualterius Arsenius.