NASS Conference 2018 - Pittsburgh, Pennsylvania

Recorded by Steve Lelievre

The annual North American Sundial Society conference was held at the Hilton Garden Inn, University Place, in Pittsburgh, PA, from Thursday, August 16 to Sunday, August 19, 2018.

Unfortunately, this year an unusually large number of delegates had to pull out of the conference due to ill health, travel difficulties, or other personal reasons. In the end, there were 30 attendees, with 20 full registrants attending the technical presentations. Attendees' countries of residence included Australia, Brazil, Canada, UK, and USA.

Registration and Reception (Thursday)

As in previous years, the conference opened with a combined registration and reception event with story-telling and door prizes. We had Phyllis Montgomery's witty observations on sundial conferences and life from the perspective of "the spouses" (partial registrations do not include attendance at the technical sessions); Peter Mayer's challenge to attendees to solve a design issue for him within 24 hours; and Jack Aubert's fascinating description of how he became interested in the sun's travel across the sky, and later dialing, from noticing the contrast in daylength and quality of the light after he moved to Finland after living in Senegal.

The 25th Anniversary Cake

Door prizes included books by Frank Cousins, Mark Lennox-Boyd, Simon Wheaton-Smith, Margo Ann King, Penelope Gouk and Hester Higton. Other prizes were a Universal Ring Dial, Dialing Scales, a silk scarf, a fine print, a marble and brass reproduction horizontal dial, a small horizontal pewter dial, a Shepherd's Dial, a stone dial from France, a Nocturnal kit, a mug, and a vintage astro-compass (donated by Arsene Fauquet). The winners included Peter Mayer, Will Grant, Jeff Kretsch, Bob Kellogg, Jim Stegenga, Bill Thibault, Jack Aubert, Frank King, Barbara Clark, Art Kaufman, Mark Montgomery, John Sibenac, Steve Lelievre, Tish Grant, Art Paque, Beverly Rehfeld, Linda Sibenac, Phyllis Montgomery, and Ken Clark.

Attendees pictured with the Myers family - relatives of Anthony Vitale, maker of the sundial seen here.

Sundial Tour (Friday)

The tour took in a simple mild steel equatorial dial by sculptor and metal worker Anthony Vitale, in Carnegie PA (family members were on hand to meet us and talk about the dial); a recent analemmatic dial in a park at Sewickley; a stone cube in the museum at Old Economy Village dated 1825 and featuring dials (horizontal, vertical and polar) on all visible faces, along with a modern reproduction of the cube in their gardens, and a modern vertical dial on one of their buildings; a horizontal dial, circa 1765, preserved at the site of Fort Pitt, see 'Fort Pitt Blockhouse Sundial' below; a large horizontal dial at the Homewood Cemetery, with a hexagonal face inscribed with the names of prominent families whose burial plots surround the dial; and a heavily patinaed 1912 horizontal dial outside the Frick Fine Art Museum.

Scenes from the Sundial Tour

Exhibits

This year's exhibits included 3D printed sundials by Bob Kellogg (see '3D Printing a Double Helix Dial' below), Art Kaufman's adjustable-to-location Portable Solar Chronometer, a small selection of dials from the personal collection of Fred Sawyer, an example of a box and mirror solar decliner by Steve Lelievre (see 'An Hours To Sunset Solar Decliner Reflection Sundial' below), a polarization dial by Mark Montgomery (see 'A Viking Sunstone Sundial' below), and materials relating to the *Rita's* dial by Ken Clark (see 'Time for Rita's Sundial' below).

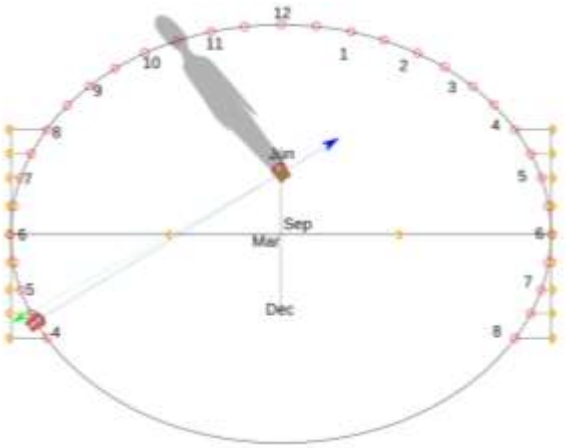
Technical Sessions I (Saturday)

A Viking Sunstone Sundial / Mark Montgomery

Mark discussed his recent construction of a dial that uses polarization of the sky to determine the time. The idea arose from a presentation at the 2017 NASS conference, when Fred Sawyer had discussed the concept of a Viking Sunstone, a natural crystal reputed to have been used by Norse seafarers for determining solar azimuth. The Norse sagas mention such a device, and the discovery of a block of Iceland Spar, a candidate material, stowed with navigational instruments in the wreck of a medieval ship adds credibility. Birefringence – the way in which the Refractive Index of certain materials depends on orientation – allows polarization of the sky to be detected. Mark described his equatorial dial using the phenomenon, and reviewed a number of other implementations.

Alternative Sunrise & Sunset Markers / Roger Bailey

Roger described a new approach, proposed by Chris Lusby Taylor, for calculation of sunrise and sunset markers on analemmatic sundials - the so-called 'Bailey Points'. The placement originally proposed by Roger indicates the directions of sunrise and sunset subject to a small seasonal error. Lusby Taylor's approach adds secondary scales, tangent to the analemmatic ellipse at the ± 90° positions. The geometry used eliminates the seasonal error. The user spots through the marker to find a position on the ellipse, then finds the point on the secondary scale that is in line (EW) with that position, thus obtaining sunrise or sunset information. The later part of Roger's talk covered graphical methods for laying out an analemmatic dial and for finding Lusby Taylor's revised marker positions, and concluded by comparing the practicability and usability of the Bailey and Lusby Taylor approaches.



Lusby Taylor's Sunrise and Sunset Markers

El Cerrito Pyramid & The Cosmic Room / Rubén Herneńdez Herrara, read by Bob Kellogg

The presentation was an illustrated tour of the fascinating home of Rubén Hernández Herrara in Corregidora, Mexico (~20.5°N). The remarkable decorations reflect a series of astronomical themes, simply and elegantly interpreted. They range from apertures in the ceiling for illuminating declination scales and sundials painted on the walls, to a garden trellis made with ironwork resembling Gaussian curves, to a *Chacmool* sculpture that catches the precise moments, twice a year, when the sun is exactly overhead.

NASS Flash 11 / Fred Sawyer

Fred talked about the collection of goodies found on the USB Flash Drive presented to attendees. This year it includes an assortment of utilities, a screen saver clock, a wide range of documents scanned/converted to PDF format [including a 220-page compilation of NASS material on dialing scales (History, Theory, Techniques) and some other very interesting works], dialing software, and more.

Alt-Az Plots on Panaoramic Photos / Steve Lelievre

As part of a pitch for a proposed public dial, Steve wanted a visual way to show when the site would be sunlit. For most latitudes, an ordinary cell phone camera can be used to capture the dawn to dusk span of the sun's azimuth even at the summer solstice, so he adapted the idea of a solargram by writing a program to superimpose an altitude-azimuth plot onto a panorama taken at the proposed location. The *Sol et Umbra* software for Android phones, by Gian Casalegno, superimposes an altitude-azimuth plot on the live camera view; Steve's solution applies to saved images, and specifically to panoramas which, unlike ordinary photos, are not rectilinear. [Note to conference attendees: after the conference, Steve received suggestions for simplifying the process used to indicate bearings and altitudes of reference points in the panorama. The revised method will be described in a forthcoming article.]

Time for Rita's Sundial / Ken Clark

Rita's is an American chain store specializing in frozen desserts and ice-cream. Ken undertook to create a vertical declining sundial for one of the franchises. His presentation covered the design and construction of the dial, including his innovative yet pragmatic use of a tow hitch ball and coupler to provide a ball and socket joint for easy fine-tuning of the dial's orientation. The dial face was printed on metal signboard. The result is a simple, bright and fun sundial that suits its location and is matched to the sponsor's visual design standards.

Ken Clark's latest dial

Extreme Ring Dials – Diamonds Are A Girl's Best Friend / Frank King


Ring Dial Pendant

When a noted jewelry designer approached him for advice, Frank became the technical consultant for a commission to produce some ring dials to be worn as necklace pendants. Frank's talk covered how solar declination affects the placement of hour marks. The exquisite finished pieces are made from precious metals encrusted with jewels, and show Islamic prayer times as well as solar time. By turning the dial slightly away from the vertical plane of the sun, the spot of light from the nodus can be positioned according to the season. Calculation of the hour lines becomes more complicated if the chosen location is close to the equator; the sun can be high in the sky or even overhead at certain times of day. The talk finished with a discussion of related designs involving the use of a slot rather than a nodus, and how that could be extended to a bowl-like dial.

Robert Nufer's Analemma Movie

This was a showing of video recording constructed by Robert Nufer, who used the many thousands of images from his year-long photographic log of the sun's position to construct a delightful animation. It can be viewed at his site (http://robertnufer.ch/) or on YouTube (https://www.youtube.com/watch?v=KRFXWB2dGcU).

An Hours To Sunset Solar Decliner Reflection Sundial / Steve Lelievre

For a recent dial, Steve combined three favorite dial-related ideas. The first is the Hours to Sunset sundial, learned from designs by Mac Oglesby. The second is a vertical dial consisting of a mirror in the back of a box that reflects a spot of light back onto a dial face drawn on the translucent front of the box – an idea promoted by Art Kaufman. The third element is the solar decliner dial. A talk by Fred Sawyer at NASS 2017 led Steve to realize that he could use the mirror-box concept for a solar decliner dial. The nodus is a tiny whole punched in the translucent front of the box. Light passing through the hole is reflected back to form a small bright spot on the front surface, which carries a mesh of curved date (declination) and hour lines. The dial is used by turning it about its vertical axis until the bright spot touches the required date curve, at which point it also lies on the applicable hour curve.

Fort Pitt Blockhouse Sundial / Roger Bailey

The previous day's tour took in the museum and site of Pittsburgh's Fort Pitt ruins. Roger described the history of the site during the periods of British-French conflict in North America, and its links to the American Revolutionary War. The buried dial was uncovered around 1894 and was reinstalled soon after. Photos taken circa 1900 shows it in excellent condition. Unfortunately, by 2006 the weather and air pollution had caused significant degradation. The dial was brought inside to a controlled environment. Special resins have been injected in an attempt to stabilize the material. Because the latitude shown on the dial is incorrect, there has been some questioning of its provenance. Roger told us a detective story of his analysis of the available evidence, leading to the conclusion that it was indeed made for Fort Pitt's location.


Fort Pitt Sundial before degradation

Van Schooten & Sawyer on Dialing Scales / Fred Sawyer

Samuel Foster published his dialing scales in 1638, without providing his proof. It was Frans van Schooten who produced the first published proof - his geometric derivation dated to 1657. Fred's presentation opened with a review of this derivation and its historical significance. He then described how, unaware of earlier proofs, he had deduced his own but then lost it - before rediscovering it decades later in a letter to Albert Waugh (now archived at the University of Connecticut). Fred took us through this elegant proof and his subsequent generalization of it. Finally, he described how he had borrowed from the layout of the Thornton Differential Trigonometric Slide Rule, to produce a new configuration of dialing scales: his Differential Dialing Scales.

An Original Bifilar Sundial with Helix Wires / Gian Casalegno, read by Bob Kellogg

This talk described a collaboration between dialists Francesco Baggio and Gian Casalegno, to produce a new kind of bifilar sundial based on the intersection of the shadows of two helical elements [note, the filar elements of the dial as actually implemented are helical gaps that admit light, rather than wires blocking it.] The helices are coaxial and have the same pitch and radius, but are offset by 180˚. They are surrounded by a co-linear semi-cylindrical dial face. The presentation included a discussion of the mathematics involved; the solution is not closed so has so be found computationally. The resultant dial face has straight declination lines and approximately, close enough, straight hour lines. Regarding the form used, a helix evokes the Staff of Asclepius, a medical symbol significant to Baggio, who is a physician. As well, the double helix is intended to represent DNA, a favorite molecule. The supporting structure resembles a rooster, symbolizing vigilance – an important quality for a physician.


Helical Bifilar Rooster

Sundial with Helix Polar Gnomon Showing Civil Time / Luigi Ghia, read by Fred Sawyer

Luigi had been inspired by a helical dial seen at a sundial symposium in 2006. That design, by Giuseppe Zuccalà, used a helical blade to cast a shadow on a poleward-pointing hour scale that slides axially to adjust for solar declination. Luigi collaborated with Tonino Tasselli to add an Equation of Time correction by use of a cam that moves the sliding hour scale, and which can be adjusted for latitude simply by changing the device's inclination. A dial using this design was implemented by Guido Dresti in 2012. Luigi has recently become aware that the independently-conceived design is functionally similar to a dial proposed earlier by Fred Sawyer.

Sawyer Dialing Prize: Software Tools For Dialing / Gian Casalegno, read by Fred Sawyer

The 2018 Sawyer Dialing Prize was presented to Gian Casalegno in his absence (due to his last-minute inability to travel). The award recognizes the outstanding contribution provided by Gian's software. His prepared remarks summarized his software including the highly-respected *Orologi Solari* for Windows, *Sol Et Umbra* for Android, and several other useful tools. As well, he covered some of the most useful, but sometimes missed, features of his programs, and mentioned several forthcoming products.

Conference Dinner (Saturday)

Thanks to the efforts of Phyllis Montgomery, we had a musical interlude during this year's conference dinner: a sing-along with dialing-themed replacement wording for well-known tunes. This light-hearted activity provided an excellent segue to two special presentations marking the 25th anniversary of NASS' founding.

Presentation Dial for Fred Sawyer

Fred Sawyer received a special sundial in recognition and thanks for his outstanding leadership and diligent efforts as NASS President for most of those 25 years; as editor of and frequent contributor to *The Compendium* throughout its entire life; as principal organizer of and frequent speaker at so many conferences; and as a knowledgeable coach to many of us. The dial was crafted from wood and glass by Don Synder, using one of Fred's designs, and was presented to Fred by Art Paque.

Phyllis Montgomery presented Phil Sawyer with a piece of jewelry as a token of our appreciation for the considerable amounts of her time given to NASS over the years, for graciously helping with conference administration, for ensuring partial registrants get the most out of their visits to the host cities, and for all the other kinds of support she has provided behind the scenes throughout our 25-year history.

As has become the convention for NASS conferences, each delegate received a gift. This year, the full registrants received a Ring Dial manufactured by commercial artist José Alfonso Solera. The dials are 8 cm (3¼″) diameter artificial sandstone material (3D printed) with a vivid outer perimeter evoking a surreal image of clouds lit by a setting sun. The dial has two nodi and scales, each covering half a year. For a discussion of the design, see Fred Sawyer's talk 'Simple Ring Dials – A Mathematical Conundrum' below.


Fred Sawyer accepts the dial from Art Paque

AGM (Sunday)

Please refer to the minutes, circulated separately.

Technical Sessions II (Sunday)

<u>3D Printing a Double Helix Dial / Bob Kellogg</u>

Bob described the process of 3D-printing a double helix dial of the type developed by Gian Casalegno and Francesco Baggio (see 'An Original Bifilar Sundial with Helix Wires' above). After briefly reviewing literature and the mathematics involved, Bob outlined the steps involved in generating a 3D virtual model. Acknowledging some practical issues with the first printing, he mentioned changes that eased the production process and improved the quality of the finished product – for instance by changing the shape of the base to improve stability, adjusting tolerances and size of recesses to aid assembly, and switching to a material (PLA) that allows for finer detail.

<u>Simple Ring Dials – A Mathematical Conundrum / Fred Sawyer</u>

Fred discussed some of the points raised by Frank King (see 'Extreme Ring Dials – Diamonds Are A Girl's Best Friend' above). Ring dials are typically short cylinders that get turned out of the vertical plane of the sun. This allows for a scale for dealing with solar declination, but introduces distortion[1]. This issue has often been ignored: the hour positions at different seasons would be calculated as if the dial was being used without turning. The earliest known treatment of the issue was by Andreas Schöner in 1562, but until now no closed form solution has been published (in recent times, the calculation has been dealt with in dialing software by using iteration).

[1] For an analogy, consider how the mesh of hour lines and declination lines on a vertical decliner differs from a vertical south dial. The mesh is becomes stretched out as the wall's declination increases, and reaches further down the wall. With a ring dial, the position of the light spot is similarly lowered as the ring is turned away from the vertical plane of the sun.

Fred set out to find a closed form solution, and was able to fine one that uses quartic equations. After a fascinating historical aside that took us through the race to develop solutions for quartic equations, he applied Scipione del Ferro's 1515 method to the problem in hand and showed that a solution can always be calculated. Fred's final topic addressed an issue affecting a dial for a location near the equator, which constrains the turn angle that can be applied to the dial.

Millennial Solar Monument at the Tropic of Capricorn / Will Grant

Will recounted his visit to *El Hito Monumental del Trópico de Capricornio*, a millennial solar monument on the Tropic of Capricorn near Antofagasta, Chile. The huge monument consists of a 10 m high concrete arch (*Arch of Capricorn)* over an 11 m long by 2 m wide path (*Way of the Sun*), facing two 12½ m high by 2 m wide concrete monoliths (*Sun Doors)*, all surrounded by a 30 m circular path (*Circle of the World*). The length of the *Way* was chosen so that the shadow of the Arch just touches one end or the other at instant of solstice. The size and position of the *Doors* were chosen so that the shadow of the *Arch* just reaches them at equinox. The *Circle* is positioned so that an imagined Tropic of Capricorn drawn on it lies on the actual Tropic. Chilean astronomer Jorge Ianiszewski calculated the required dimensions and placement of the structures. The *Arch* is adorned with a number of copper panels embossed with information about the structure and explaining how it can be used to demonstrate and measure seasonal events related to the sun.


El Hito Monumental del Trópico de Capricornio

Gnomonic Activities In Italy – A Survey / Gain Casalegno & Luigi Ghia, read by Bob Kellogg

This was a discussion of the state of gnomonics in Italy: the use of an email reflector, a description of the annual conference, how an online publication (Orologi Solari magazine) exists but no print journal, and how the gradual aging of the Italian sundial community is a threat to its future. To aid its sustainability, more international links are sought. There is no Italian sundial society, but there is a sundial chapter of the national astronomy organization.

New, Soon-to-be, and Old Sundials in St. Louis / Don Snyder

Don spoke about changes to the inventory of dials in St. Louis area over the year since the NASS 2017 conference. A new dial, designed by Don, is about to be installed at the Bellefontaine Cemetery in St. Louis. It will have a milk glass dial plate and be mounted on a limestone pedestal by Abraham Mohler. There is soon to be a new metal armillary sphere by Bill Turner in St. Albans, and there are early plans for an analemmatic dial at the public library in De Soto. The two existing dials selected for review were a dial commemorating the total solar eclipse on Aug. 21, 2017, designed by Don Snyder with the dial plate by Abraham Mohler and the gnomon by Bill Turner; and a vertical dial at St. Mary's of the Barrens, a church in Perryville MO. The latter is attributed to Italian immigrant priest Brother Angelo Oliva and is dated between 1823 and 1839.


St. Mary's of the Barrens

Sciathericum Seleniacum / Fred Sawyer

Fred spoke first about a lunar dial described by Athanasius Kircher in his 1646 book *Ars Magna Lucis et Umbrae.* It is a horizontal dial with a series of concentric chapter rings, each corresponding to a different age of the moon (the number of days since new moon). Because the moon advances by 48 minutes per day, the positions of the marks for any chosen hour produce a spiral effect which is emphasizes by lines in the book's illustrations. For practical convenience, Kircher urges the drawing of two dials, one for waxing moon and one for the waning moon. However, there is no need for this from an astronomical perspective.

Unfortunately, errors in the engraving (done by Pierre Miotte) interfere with correct operation of Kircher's dial as published. In 1992 Girolamo Fantoni proposed an equivalent dial, unaware that his supposed innovation had been described by Kircher 350 years earlier.

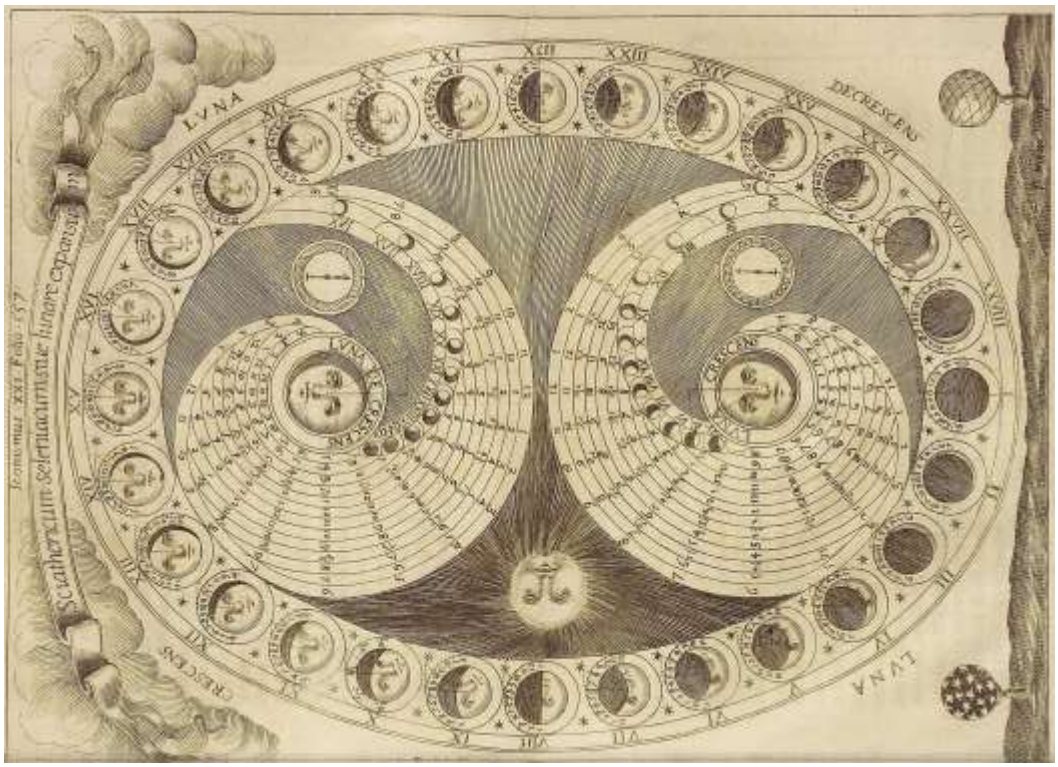


Diagram for the face of Kircher's lunar dial.

Postscript

I am sure attendees will join me in thanking our local hosts, John and Linda Sibenac, for their efforts relating to the conference and in tracking down area sundials for the coach tour itinerary. We must also acknowledge the hard work of organizers Mark Montgomery and Fred Sawyer, and the contributions of Phyllis Montgomery and Phil Sawyer. As well, NASS thanks Jim Tallman for working on the presentation dial for the Sawyer Dialing Prize even though he was injured at the time, and Don Snyder for making and donating the dial presented to Fred Sawyer.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