NASS Conference Retrospective: Asheville NC, August 2012

Roger Bailey

Asheville NC was an interesting site for the NASS Conference in 2012 as it is not a well-known destination. All those who made the effort to attend were rewarded by the warm welcome from our local hosts and the interesting program. It was a time to greet old colleagues and meet newcomers in a relaxed welcoming environment.

The activities started on Thursday afternoon 16 August with the reception. Fred had gathered a good collection of sundial related books and paraphernalia as door prizes. Tickets were used to allow choices to maximize the chance of reward. You could plunk all your tickets on one prize or you could spread your tickets to increase your chances of winning something. Here are the prizes and winners.

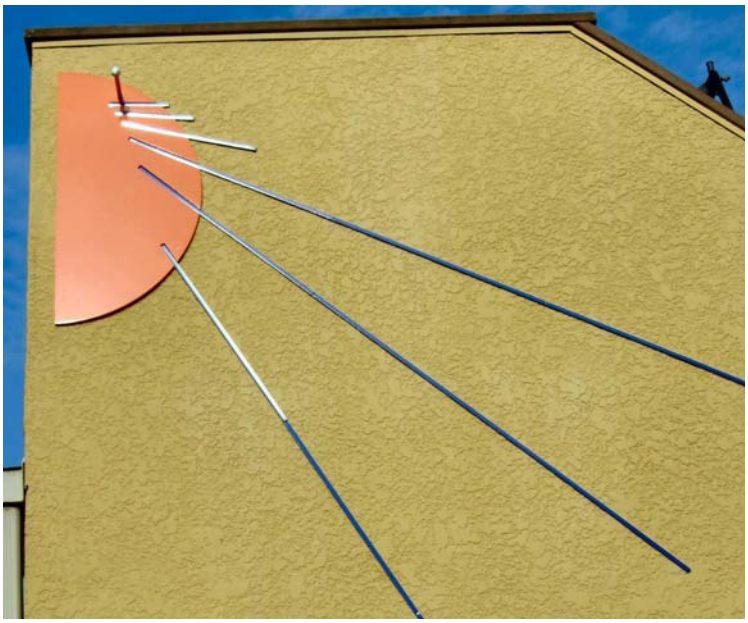
Warren Thom won the Stieff pewter reproduction of a Williamsburg sundial. Tish Grant won the copy of Sharon Gibbs' *Greek and Roman Sundials*. Betsy Wilson won a copy of Frank Cousins' classic, *Sundials-The Art and Science of Gnomonics*. Alice io Oglesby won two books with cutouts by Gerald Jenkins and Magdalene Bear *Sundials and Timedials* and *Sonnenuhren*. Jeff Kretsch and Frank King won the acrylic refraction sundials designed by H. Hollander. Bill Gottesman won the book on *The Bagnold Sun Compass*. Charles Olin and George Wilson each won a copy of Mark Lennox Boyd's *Sundials: History, Art and People*.

Sundial Tour, Friday 17 August

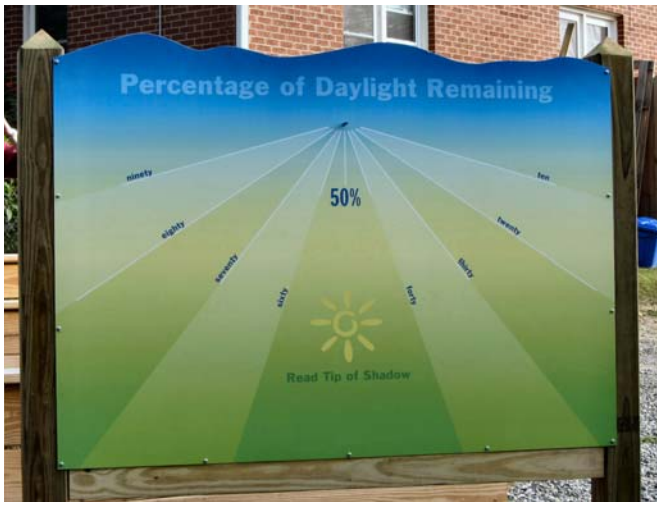
A special feature of the Asheville sundial tour was the opportunity to meet the creative people who crafted the dials. At each location the dial creators were available to describe and interpret their work.

Sunny Point Café, Asheville

Our first stop on the sundial tour was the Sunny Point Café in West Asheville, 56 Haywood Rd. Here we saw three interesting sundials created by Alice io Oglesby, Hugh Munro and inspired by Mac Oglesby. A highlight was the newly installed highly visible "hours since sunrise" dial on the east facing wall of the Sunny Point Café. This dial has a horizontal point gnomon projecting from a semicircular disc representing the rising sun. Five hour lines radiate from the disc. The hours from sunrise are read from the shadow of the nodus at the tip of the gnomon. A small plaque explains how to read the sundial.



In the adjacent kitchen garden of the Sunny Point Café is a second sundial by Alice, Hugh and Mac. This sundial has non-conventional markings for the "Percentage of Daylight Remaining". This is a unique re-interpretation of temporal or seasonal hours. Here daylight, varying in length with the seasons, is divided into 10% intervals rather than 12 hours. The lines are drawn straight and radiate from the gnomon base, a reasonable approximation.



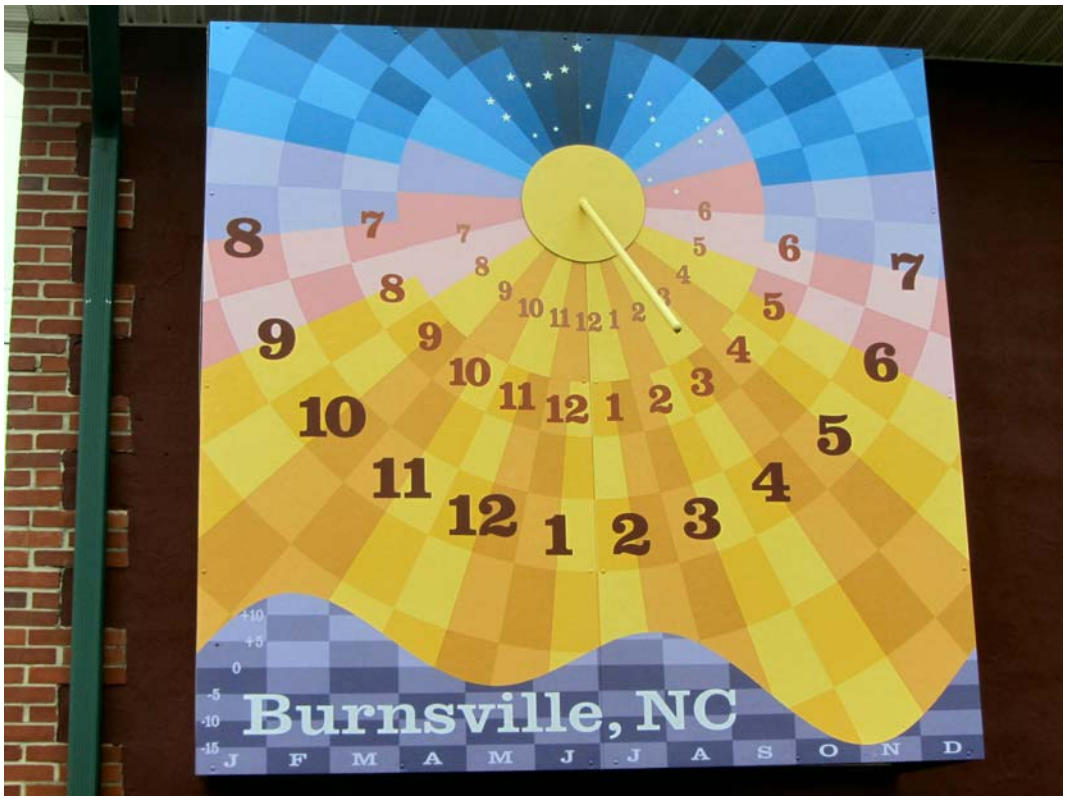
The dial is printed on a plastic coated aluminum sheet 1/8" thick and about 4ft. wide and 3ft. high, mounted on a wooden post and beam frame. This vertical dial faces due south so mid-day, 50% of daylight remaining is a vertical line straight down from the horizontal point gnomon. Again the reading is based on the shadow of the gnomon tip. The sun shines on the back or north facing side of the dial in the early morning and later evening during the spring and summer.

Also on display at Sunny Point was the Whistlepig Farm Wedding Dial, a vertical declining sundial by Alice and Hugh for friends, Anne and Tom. This dial is also plastic coated aluminum sheet, 21" x 45", printed with black hour lines on seasonal pastel colors. The point gnomon is horizontal with the time and date read from the tip of the shadow. An additional date line is added to mark the wedding anniversary, 29 May.

Biltmore Estate Analemmatic

The tour moved on south of Asheville to the famous Biltmore Estate of George Vanderbilt. At the Kitchen Garden near Antler Hill Village, the Biltmore Estate constructed in 2007 an interesting 16ft. analemmatic sundial designed by Alice io Oglesby, Hugh Munro and Mac Oglesby. The months on the date table were decorated by typical garden products of the seasonal growing cycle. Later in the conference, Alice gave a presentation and demonstration of the use of stains to paint on concrete. The hour posts were short hemlock posts installed by the estate gardeners. The numbers on the

posts were hand forged by the estate's blacksmith. These are moved to correct for daylight savings time. The hours are offset to correct for longitude, as solar time is 30.3 minutes slow at 82° 35.153.



Burnsville Quilt Block

After lunch at the Biltmore Deerpark Restaurant, we moved north to the town of Burnsville to see the Quilt Block Sundial, one of over 200 colourful quilt block paintings along the North Carolina Quilt Block Trail. We were welcomed by the Mayor of Burnsville and Barbara Webster who outlined the Quilt Block Trail Project. The Quilt Block Sundial is one of over 200 colorful Quilt Block patterns decorating buildings and barns in western North Carolina. The Quilt Block sundial was explained by Bob Hampton, astronomer designer, and Martin Weaver artist. The vertical dial has three sets of hour markings for solar time standard time and daylight savings. The equation of time graph is represented as a mountain profile of rolling purple hills at the base of the dial. The Quilt Sundial was an impressive example of volunteer teamwork and community support. The star pattern shows the sky at sunrise on 29 January 1833 when Yancey County was incorporated. Burnsville is the county seat. Also on display were other sundials and instruments by Bob Hampton including a 15" equatorial, a translucent vertical dial and a declinometer that determined the wall declination as 3°west of south.

Marshall Armillary

On the return trip to Asheville we diverted a few miles west to meet Brian Leonard and see his 4ft. diameter armillary equatorial sundial installed on a concrete base in 2001. Brian is a local steel fabricator who described the cutting, bending and welding to form the four rings, equatorial, horizontal, prime vertical and prime meridian. The hour numerals are torch cut in the equatorial ring. He can reproduce the design for any location quite economically.

Presentations Saturday 18 August

Point and Polar Gnomons:
The first presentation on Saturday was by Roger Bailey who pointed out the differences between sundials using a polar axis gnomon at those that use a point, typically the end of a perpendicular rod. Early sundials used point gnomons and generally had seasonal hours, the day being divided into 12 hours. These hours changed in length depending on the season and the latitude. The equal hours were introduced as mechanical clocks were introduced. The first known example of a polar axis gnomon was the complex dial by Ibn al-Shatir, 1371 in Damascus. Many believe the polar gnomon was introduced as it showed equal hours while gnomons at other angles had hours that changed with the seasons. But point gnomons can also show equal hours. Point gnomons can show much more including date lines, altitude, azimuth, equation of time, obliquity *etc*. The polar axis gnomon can only show time. But it does a good job telling time with clear shadow lines that can be read at a distance. There is much more design flexibility with a polar gnomon. The design of a point gnomon dial is much more constrained, with time lines compressed together near noon and running off on a tangent towards infinity when the sun is low, close to the plane of the dial. Perhaps the best design is a polar axis gnomon with a nodus providing a shadow point.

Practical Issues
Alice io Oglesby gave an outline of some of the practical issues encountered when turning sundial concepts into reality using readily available tools and materials. The presentation focused on the use of concrete stain to create the artistic elements shown on the Biltmore analemmatic sundial. She outlined details like the type of stains available from suppliers like Smith Paints or Duval Paints, the best brushes for different uses, concrete preparation, applying the stain, touch up and sealing the surface. Alice also discussed printed sundials like the coated aluminum signboard sundials shown at Sunny Point Café. She pointed out the need to verify the data when going from a CAD drawing like Adobe Illustrator to a dxf file for the print shop.

An Eclipse Sundial
Bill Gottesman noticed that the crescent shape of a partially eclipsed sun could be used to tell the time. He developed a technique that converted the angle of the link between the tips of the crescent into an estimate of time. Of course data is valid for one specific location and eclipse but the technique based on sundial and projection mathematics is general. Bill admitted the math outlined in the presentation was more difficult than he expected. The page below is for California, the San Mateo Makers Faire, 20 May 2012.

The Heliochronometer Also Rises
The title of Dudley Warren's presentation explains how a little altitude adjustment solved the problem for a relocated sundial. In 1983 Chevron Oil Field Research Company employees designed, built and installed a bowstring type sundial at La Habra CA. This elegant stainless sundial stands 6.5ft. high with a diameter of the equatorial ring 5ft. It is an accurate heliochronometer as it incorporates an EQT adjustment to rotate the dial on the equatorial axis. The research center was shut down and re-established 40 miles away at San Ramon by the Chevron Petroleum Technology Co. In 1999 the sundial was moved and reinstalled but the dial was not aligned properly or adjusted daily to maintain the accuracy of the heliochronometer. Dudley Warren became interested - tracking the sundial to its new location and learning

about its history. He proposed to Chevron a simple realignment to restore the accuracy of the relocated dials. Based on math by Bill Gottesman and Fred Sawyer, he calculated the size and orientation of a wedge to raise and tilt the dial for proper solar orientation. With the usual problems dealing with a large company in a secure restricted research facility, he was able to provide the wedge and properly align this sundial.

An Excursion in Nomography

Fred Sawyer took us through an interesting history of various nomographs to solve spherical triangles and design sundials. Fred has found once again that Samuel Foster published the key concept. The excursion starts with Mike Cowham's interest in reproducing a historic quadrant in the Oxford Museum of the History of Science. The quadrant can be used as a universal altitude sundial. The math goes back to Samuel Foster's Geometric Square developed in 1624 and published posthumously in 1659. This square with sine scales on all sides and a tangent scale on the bottom is a nomogram that solves the cosine law in spherical geometry. Julius Mandl showed how the concept could be modified to solve all cases of spherical triangles including for altitude and time, knowing latitude, azimuth and declination. Fred developed that concept to produce "Prof Sawyer's Ultramatic Dialing Computer". Ron Doerfler recently published a similar nomograph. This nomograph goes back to Maurice d'Ocagne in 1894. Ocagne also reinvented Foster's geometric square in 1891. Many have followed with similar nomographs and drawing instruments including a 1918 article and 1921 patent by G.W. Littlehales. Fred ended by thanking Walter Heath who properly attributed the nomograph to Samuel Foster.

Sundials in Mallorca

In his next talk Roger Bailey took us on a pictorial tour of Mallorca, an island in the Mediterranean south of Barcelona, famous for sun, sea and sand. But Mallorca has over 1000 sundials registered, one of the highest densities of sundials by area or number of people. Most of the dials are historical but many are new, large and complex. We were introduced to Rafael Soler, Professor of Engineering who was responsible for the redevelopment of the ports infrastructure of the Balearic Islands including Mallorca. His latest interests are catenary bifilar sundials, and refraction instruments.

Parallel Time: An East/West Vertical Sundial

Peggy Gunnerson, an artist, sculptor and sundial designer described a new type of sundial. The concept is simple, a colorful accurate display of the passage of time using two parallel stained glass panes. The stained glass pieces are oriented facing east and west. The angled top is the gnomon at the latitude angle. The shadow from the east pane falls on the west pane and goes down as time progresses towards noon. Each hour used a different color of translucent stained glass. After noon the west pane cast the shadow onto the east panes, starting at the bottom and working up. This is an excellent artistic way to use a pair of east and west facing sundials to tell time throughout the day. Peggy had on display pictures and models of many other sculptures incorporating subtle sundials.

Projected Refraction Sundials with Ambigram

Fred Sawyer's next presentation brought together two little known concepts to create a unique sundial design. Refraction sundials involve a block of transparent acrylic with a high refractive index. Light is bent entering the different medium. This constrains the projection of a point on the surface to a compact pattern of hour and declination lines. Generally the sundial lines are printed on an opaque surface at the back, but the sundial pattern can be transmitted onto a plane. The design math has to trace the refraction in and out of the transparent block. Ambigrams are printed letters that spell different words when viewed from a different angle, flipped or rotated. Coded messages have used ambigrams. Fred gave several interesting examples and showed several ambigrams on the words from Horace, "CARPE DIEM" a common sundial motto, "Seize the Day" or Seize the Opportunity. His final design was a refraction sundial that showed CARPE on the acrylic block and DIEM in the projected shadow. Before the conference dinner, each full registrant received a CARPE DIEM projected refraction ambigram sundial custom designed and etched for their home location. Thank you, Fred, for this special memento of the conference.

Shadows at Toshogu Shrine in Kawagoe:

Barry Duell returned to the Senbu Toshogu Shrine looking for significant alignments. One possibility was Ley lines connecting various Toshogu Shrines. With over 100 shrines available there are many possibilities. The dates 12 April and 1 Sept share the same declination and offer several solar alignments. One is the sunrise alignment. On those dates the rising sun can shine through the outer building and into the inner sanctum. Also on those dates the sun is aligned to the main stairs at 260° azimuth and 28° elevation. The dates may be related to the 1 June, 1616 death of Tokugawa Ieyasu, the 1st Tokugawa shogun who unified Japan, or perhaps 30 August 1590 when Ieyasu entered Edo (Tokyo) to set up the first unified government. Barry is also looking at shadow alignments with post and solar alignments along the plane of the stairs.

NASS Flash Drive: Again this year all full registrants received a flash drive containing all the presentations for the Conference. The 8 GB drive was also loaded with presentations from the last 3 conferences, 27 books related to dialing and over 50 apps, dialing software, utilities, programs, viewers, *etc*. All the apps can be run from the flash drive. None requires installation on a host computer. Personally I have found these conference flash drives very useful.

The Sawyer Dialing Prize was presented to Frank King "in recognition of his innovative mathematical and astronomical solutions to problems encountered in the modern design of notable sundials." Frank followed the presentation with *See Naples and Dial – An Italian Job* a delightful talk on a most unusual circular analemmatic dial he designed for the Metropolitana of Naples.

The Conference Dinner: Before dinner, each full registrant received a CARPE DIEM projected refraction ambigram sundial custom designed and etched for their home location. Thank you, Fred, for this special memento of the conference.

Sunday August 19 started with the Board Meeting/ Annual General Meeting reported previously.

Trigonometric Compass:
Fred Sawyer took us "yet deeper into the woods" of the history of mathematics on the topic of Jean Francois Richer's instrument for the reduction of lunar distances and solving spherical triangles. Although Harrison's clock was awarded the prize for finding longitude, astronomers continued to favor lunar distances. As the moon moves across the star field, it should be possible to determine time and longitude by measuring the moon's distance from known fixed stars. Having conquered several obstacles, astronomers found that the last step, correcting for parallax and refraction, remained a challenge. The British favored tables, the French calculation. One method to aid calculation was Richer's Triangular Compass. The hinged arms have sine scales. Sliding arms added and subtracted angles to give solutions for spherical triangles where the arms crossed. Later Callet added a tangent scale to solve the last two cases of spherical triangles using Napier's analogies. The major problem was accuracy reading the compressed sine scales. Fred showed how the instrument could be applied to sundials, specifically rectifying a reclining declining sundial.

Mind the Gap
Frank King's presentation was on the topic of sundials and leap years. Showing the date on the analemma curve is difficult as the date moves along the curve by about 6 hours each year until corrected with a leap year. This can be shown as a gap in the curve that grows each year and collapses at leap years. Calendars now insert the difference as 29 February but traditionally the day was added to the sixth day before March

1st - in Latin *ante diem bis sextum kalenda martii.* Leap years in France and Italy are still referred to as année bissextile and anno bisestile. Frank's design for the large analemmatic noon mark on the London Stock Exchange, Pater Noster Square shows how he allowed for the six hour per year shift in the date marks.

Ibn al Shatir's "Box of Sapphires:
Roger Bailey returned to the sundials of Ibn al Shatir, this time describing his Box of Sapphires, an astronomical compendium. This small brass box 12cm square 3cm high contained an astrolabe style alidade & equatorial sundial on its lid, a removable slider plate with sundial and Qibla inside. Not only does the instrument still exist in Aleppo Syria but two users guides have been found. The documents were translated and published by Louis Janin and David King in 1987 "Islamic Astronomical Instruments". A second removable lid has also been found. The presentation describing each of the instruments was based on these documents and recent pictures by Dr. Rim Turkmani.

The last hour was saved for short presentations.

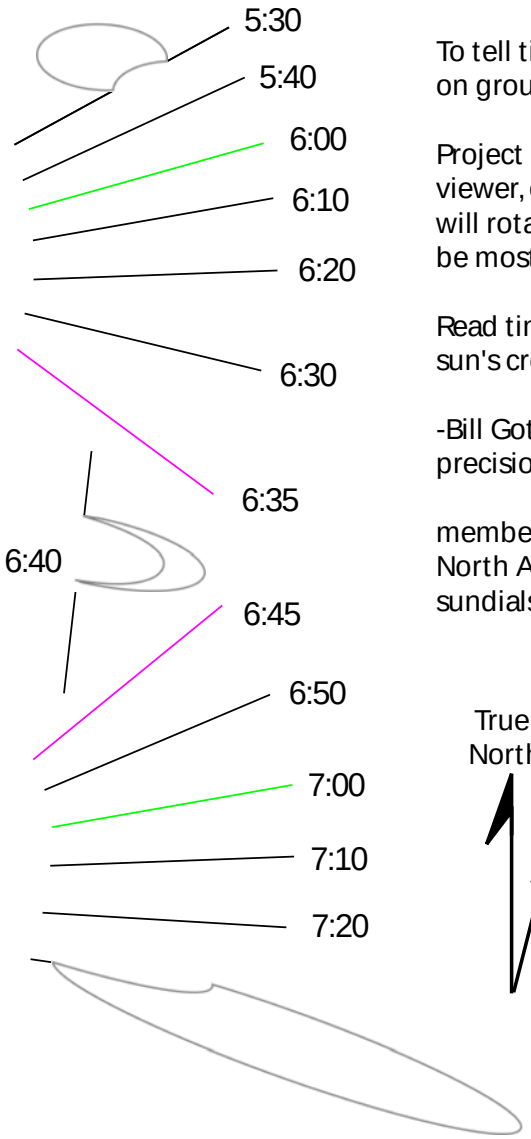
Bill Gottesman showed how the science of sundials can help sharpen knives. The same equation for hour lines on horizontal sundials applies to the knife angle for the desired bevel using sharpeners like the Spyderco Tri-angle Sharpmaster.

Roger Bailey showed how Napier's analogs could be used to resolve solar alignment questions, specifically the spectacular light displays at the Palma Mallorca cathedral, the "Cathedral of Light." On 2 February and again on 11 November the light from the east rose window shines on the west wall just below the rose window forming a colorful figure of eight pattern. At the winter solstice, the light projects directly on the west window. Napier's analogies solved for the altitude and time given the azimuth, latitude and declination. The position of the spot of light could then be traced along the floor and up the back wall through the seasons.

Ken Clark showed a patio sundial concept he created using a 12' brick paver. On the round section he outlined a vertical sundial. Along the lower rectangular portion was a vertical meridian line. With this initial prototype he hoped to encourage development of this simple concept.

The conference concluded on time and most are now looking forward to meeting next year in Boston.

Eclipse Sundial, San Mateo Maker Faire



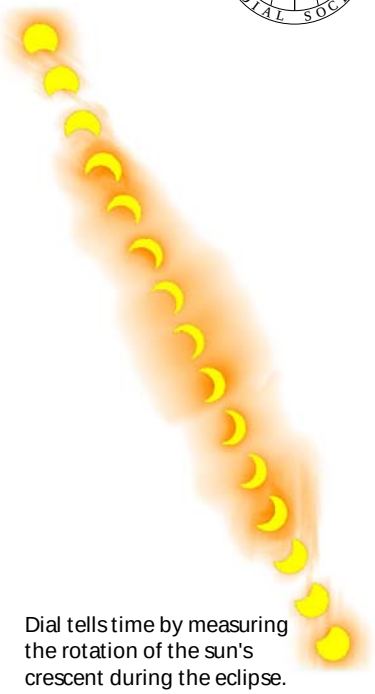
To tell time during eclipse, set paper flat on ground, oriented to true north.

Project sun's image onto dial using pinhole viewer, or binoculars. Sun's crescent image will rotate during the eclipse. Rotation will be most rapid near 6:40.

Read time from line which orients along sun's crescent points.

-Bill Gottesman
precisionsundials.com

member
North American Sundial Society
sundials.org



Dial tells time by measuring the rotation of the sun's crescent during the eclipse.

May 20, 2012
Eclipse Begins 5:17 PM
Peaks 6:33
Ends 7:40


Quilt Trails

Minutes of the NASS Annual General Meeting, August 2012

Roger Bailey, Secretary

President Fred Sawyer called the Annual General Meeting to order at 8:40 AM, August 19th at NASS Conference in Asheville NC.

Directors and Officers Present: Fred Sawyer (President and Editor), Mark Montgomery (Treasurer) and Roger Bailey (Secretary). Don Petrie (VP) was unable to attend this year.

Roger Bailey recorded the previous annual meeting (August 2011). The minutes were accepted as distributed in the conference package and published in *The Compendium*, Dec 2011.

Mark Montgomery reviewed the financial statements to June 30,2012. The bank balance remains healthy, as the Unrestricted Net Assets were $32,709.65, a minor increase ($1688.59) from $32,021.06 last year. In fixed assets, the CD burner was replaced and an external hard drive for backup of the registry was added.

Dudley Warner presented the report of the Nominating Committee (Dudley Warner, Mac Oglesby and Len Berggen). They are very pleased to present members Fred Sawyer and Mark Montgomery to fill once again the offices of President and Treasurer respectively. As no other nominations had been received by the committee by the July 1 deadline, Fred and Mark were declared elected for the next two calendar years.

Fred Sawyer presented Don Petrie's membership report. Membership is essentially the same as last year, currently 312. We lost 24 but gained 22 new members and three returning members for a current total of 312. Most new members joined via the website.

Bob Kellogg presented the webmaster's report. The new website is substantially changed through efforts by Bob for design, programming and content with Jacque Aubert for hosting the website. Bob showed the new look of the website and presented charts on the usage, averaging about 20,000 visits per month, peaking at 35,000 visits in December.

Larry McDavid's report outlining the status of the NASS Registry was presented by Bob Kellogg. This reported the submission of 36 new dial entries and 12 updates. Frequent submitters provided the majority of the information. The new website now shows the complete registry. On line registration is significantly improved allowing for large digital pictures and providing excellent feedback. The quality has been improving but most initial submissions are deficient in data and images. Correspondence with the submitter is often required.

The NASS Conference in 2013 will be held in Boston MA NC with Sara Schechner as the local host. The NASS Conference will co-ordinate with a special exhibit at the Collection of Historical Scientific Instruments, Harvard University. The date is expected to be in August.

Final Report of the Nominating Committee for 2012

The 2012 Nominating Committee of the North American Sundial Society is very pleased to present members Fred Sawyer and Mark Montgomery to fill the offices of President and Treasurer, respectively. Having received no other nominations from the membership by the July 1 date, we hereby declare the nominations closed. As per the By-Laws, the committee declares the election final and we offer congratulations to President Fred Sawyer and Treasurer Mark Montgomery on their reelection for the years 2013-2014.

Respectfully submitted by the Nominating Committee for 2012, Dudley Warner, Chair
Mac Oglesby
Len Berggren

Biography of Fred Sawyer

Fred Sawyer is a cofounder and the current president of NASS, and a vice president of the British Sundial Society. He is also the editor of *The Compendium*, having been responsible for each of the 75 issues to date. He has authored over 85 articles on gnomonics, written numerous programs, and edited or designed the majority of the items NASS has for sale. Fred has also planned and coordinated sixteen of the NASS conferences and is a regular speaker at both NASS and BSS conferences. His interests lie primarily in theory, new dial forms (including his own equant, compressed gnomonic, Ptolemaic coordinate, Foster point, and other varieties), historical techniques for drawing dials, and the work of Samuel Foster, a 17th century dialist. Fred was educated at Yale and the University of Pittsburgh, where he earned degrees in Mathematics & Philosophy, Philosophy, and History & Philosophy of Science. An actuary by profession, Fred is a Fellow of the Society of Actuaries and worked as a senior officer at a Fortune 500 company until he opted for early retirement in May 2000 to pursue his true interests. Fred and his family instituted the Sawyer Dialing Prize awarded each year at the NASS conference.

Biography of Mark Montgomery

Mark Montgomery has been a member of NASS since 2004. He became acquainted with sundials when on assignment in Rome, Italy and has enjoyed them ever since. Mark hunts unique dials across the Midwest and has made several small sundials for personal enjoyment. He has contributed articles to the Compendium and developed a Houston sundial trail for “Sundials on the Internet”. He is also developing a standards based curriculum focusing on sundials - including elements of math, science, literature, art, and music. Mark graduated from Rose-Hulman Institute of Technology in 1975 with a BS in Chemical Engineering. He retired in 2010 after working 35 years with Amoco and BP. While working with the PTA process, Mark was awarded a U.S. Patent for a unique reactor control strategy. Mark currently volunteers at the Indiana Dunes National Lakeshore working on prairie restoration and invasive species projects. His wife Phyllis is a music teacher; daughter Amber is a leadership trainer for the National Park Service in Washington, DC; son Aaron is a robotics engineer in New Richmond, WI.