

Conference Retrospective: Portland 2016

Roger Bailey, Secretary

NASS held the 2016 Conference in Portland Maine at the Holiday Inn by the Bay, June 23-26. Acting as local hosts, Jack Aubert and Mark Montgomery assisted Fred Sawyer organizing the conference. Forty-one people attended, with thirty being full registrants attending the technical presentations. Participants included thirty-one Americans, six Canadians, two from Japan, one each from Brazil and Australia.

Registration and Reception: On Thursday afternoon we enjoyed light refreshments and an opportunity to greet old friends and meet new people who share our interest in sundials. Three speakers, Fred Sawyer, Mark Montgomery and Bill Gottesman, gave lively, humorous talks on their introduction to sundials.

Door prizes were won on the basis of each person voting with tickets for the prizes of most value to them. The twenty-two prizes available this year provided excellent chances to win. The winners of the prizes, books and sundials, are listed below.

1-2. Frank W. Cousins, *Sundials – The Art & Science of Gnomonics* won by John Goodman and Art Kaufman.

3-4. Mark Lennox-Boyd, *Sundials: History, Art, People*, won by Barry Duell and Bob Kellogg

5-6. Dave Scott's CD Sundial won by Dick Koolish and Andrew Theokas.

7-8. Hester Higton, *Sundials: An Illustrated History of Portable Dials* won by Ken Dagel and Jesse Sarkis

9-10. Margo Anne King, *Designing Sundials: The Graphic Method* won by Steve Lelievre and James Stegenga

11. Finger Ring Sundial won by Jeff Kretsch

12. Shepherd's Sundial won by Patrick O'Hearn

13. Nocturnal Geocoin won by Tasoula Berggren.

14. John Heilbron *The Sun in the Church: Cathedrals as Solar Observatories* won by Barbara Clark

15. Margaret Stanier *Oxford & Cambridge Sundials* won by Art Paque

16. Reproduction Glynne Sundial won by George Wilson.

17. Solar Eye won by Kent Kraft

18. Albert Waugh, *Sundials: Their Design Construction and Use* won by Amber Kraft

19. Denis Savoie, *Sundials: Design Construction and Use* won by Jack Aubert

20. Penelope Gouk, *The Ivory Sundials of Nuremberg 1500-1700* won by Len Berggren

21. Michael O'Mally, *Keeping Watch: A History of American Time* won by Kate Aubert

22. Beach Stone Sundial won by Ken Clark

Sundial Tour Day: On Friday 24 June we started by walking a block from the hotel to the Children's Museum of Maine at 9:15 am. There we viewed the Camera Obscura and related displays and heard a short presentation by Mark Montgomery on Sun Observations with Pin Hole Cameras. Later we received Solargraph kits. We then boarded the bus and proceeded to the Maine State Pier to view an Armillary Sculpture. A TV cameraman recorded parts of the tour for the local TV news report on the conference.

1. Armillary Sculpture: 43° 39.49586' N, 70 14.9734' W

This large sculpture is not a sundial or even an armillary sphere but an abstract skeletal globe. It is not aligned north nor at the latitude angle. The rings are arbitrarily placed and not where the equator and tropics cross the continents. There is no equatorial ring marked with hours. Otherwise it is a fine looking sculpture.



2. Falmouth Library Armillary Sundial $43^{\circ}43.3937' N$, $70^{\circ}14.17557' W$

Near the southwest door of the Falmouth Memorial Library is an armillary sundial about 18" in diameter. The armillary has a cast prime meridian ring. The equatorial ring is embossed with hours and the prime vertical ring is plain. The gnomon is the correct slope but the dial is free to turn on its base so it is not oriented north. The cast base is marked with the zodiac and compass points. The plinth is a light granite pillar.

3. Bowdoin College Vertical Declining Sundials:

$43^{\circ} 54.457' N$, $69^{\circ} 57.810' W$

On Hubbard Hall in Bowdoin College, Brunswick Maine are three vertical declining sundials. The building is oriented about 18° west of south so the afternoon dial is west 18° north, the south facing dial is south 18° west and the morning dial is east 18° south. We arrived just before 1 pm EDST just after the sun left the morning dial and as it started to shine on the afternoon dial. All the dials are adjusted to correct for longitude by $20'9''$ sun slow as 12 hour lines are not vertical. The sundials were about 4 ft square, similar to adjacent windows. All were placed high on the gabled ends of Hubbard Hall.





4. Bowdoin College Horizontal Sundial 43° 54.567' N, 69° 57.725' W.

Also at Bowdoin College is a simple horizontal sundial, a 1 ft standard cast commercial dial on a granite plinth located across the quadrangle to the north. The dial was in the shade and various compasses indicated an alignment error but the dial in the shade remained indeterminate.



5. Evergreen Cemetery Equatorial Sundial 43° 40.7697' N, 70° 17.7645' W

This cemetery at 672 Stevens Ave, Portland, is west of Back Bay by less than a mile. Prominent in the graveyard is a large equatorial sundial about 4 ft in diameter on a 4 ft plinth. The dial is probably cast anodized aluminum. The hours are VI to IV with 5 minute increments. The scale is shifted to correct for longitude but not daylight savings time. There were no plaques indicating this is a specific memorial.

6. Baxter Memorial Sundial 43° 40.256' N, 70° 16.682' W

We did not visit this significant dial as the driver had the wrong address and buses are not allowed on Baxter Boulevard around Back Bay. This information is from the NASS Registry. The large bronze sundial about 3 ft in diameter is set on a low granite dais engraved with "Baxter Boulevard". The dial has hours marked from V to VII with the 24-point star that continues with even spacing on the south section of the dial.



7. Osher Map Library

The tour continued to The USM Osher Map Library for a discussion with Matthew Edney on the analemma on maps and globes. In the Ptolemeic sense, the analemma is a drafting device to design sundials. The figure of eight plot of the equation of time against declination is a latter use of the term. These analemma appeared on globes but added no utility for navigators. The analemma figure remained as a style feature filling the void in the Pacific Ocean like “There be dragons here” in the undefined corners of maps and globes.

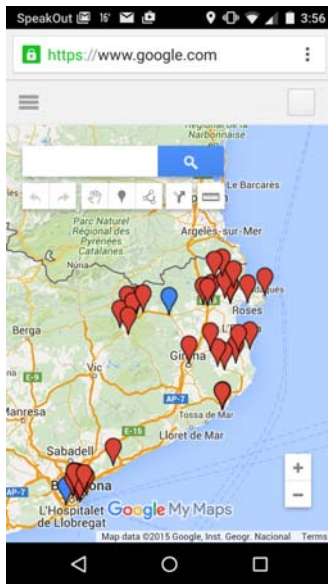
The tour continued with a short walk across the campus to the Southworth Planetarium for a brief talk on Stonehenge and stone circles. The tour finished back at the hotel on time at 5:30



Saturday 25 June: After breakfast the technical presentations started on at 8:45.

Sundials in Catalonia:

Roger Bailey described his trip to Catalonia to search for sundials. This autonomous region in north east Spain has one of the highest concentrations of sundials in the world. The BSS had a Sundial Safari there in 2012 so Roger contacted the organizer, Mike Cowham, and got detailed information on their itinerary. He also found the sundial registry of the SGC “Societat Gnomonica Catalonia” very useful to plan his route. To aid his search he created a specific Google Map based on the SGC information. Here the sundials are marked as specific points of interest including 12 sundials in Barcelona and 14 in the town of Cabrils. The medieval town of Besalu served as a base for exploring north east Catalonia near the Pyrenees and the French border. The map available here <http://tinyurl.com/SundialsCatalonia> works on a smartphone as shown below. Click on any marker to bring up information and usually a picture. One favourite was a beau soleil in Cabrils.

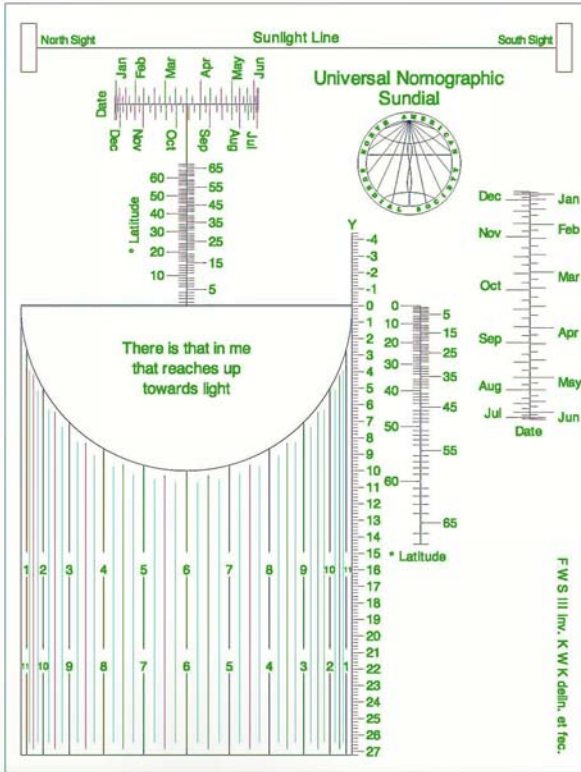


An Evolutionary Method Of Setting Out Disc Sundials: Steve Lelievre introduced us to a

type of disc dial popular in the 17th century. These Disc Sundials are based on ring dials designed for a specific latitude. A movable date marker casts a spot of light or shadow on a raised lip hour scale. To correct for errors at different dates and times the disc is oblong rather than circular. The correction is an approximation. Steve's challenge was to develop a technique to minimize the error for any specific design. He developed an Evolutionary Algorithm and used the Solver function in Excel to try many options and work towards the curve with minimum error. His spreadsheet technique reduced the intrinsic discrepancy from 10 minutes for the worst day of the year for the traditional approach to less than 5 minutes.

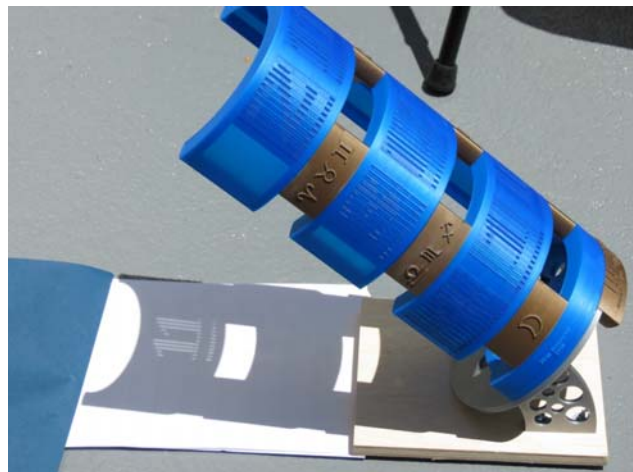


Rectilinear Altitude Dials: Fred Sawyer showed us his 1976 sundial design innovation, a "Universal Nomographic Sundial". He published the design in the BSS Bulletin in Oct 1994. The design starts with the 1474 concept of Regiomontanus, a sundial on a flat board that is turned and tilted, oriented to the sun to tell time from a bead on a vertical string. The suspension of the string is from a brachiolus set on a declination vs. latitude grid. Fred's concept replaces the brachiolus and 2D grid with a 1D slot for lat/Dec slot. To set the string suspension beads position, he uses a multiplication nomograph above the slot. To set the length for the bead, he uses a subtraction nomograph beside the hour lines. Fred reviewed the mathematics for the Universal Nomograph dial. He showed how the design evolved from other rectilinear sundial designs that evolved from the Regiomontanus design including Peter Apian, Sebastian Munster and the Capuchin sundial, Andreas Schöner 1662, Georg Hartman 1535 and Jan Kragten with the Universal capuchin, a sailing wooded shoe. All full participants received a Universal Nomograph Sundial kit based on Fred's invention, designed and laser etched onto a wooden sheet by Kevin Karney.



A Pinhole Sundial: After the morning break, John Goodman described what he called a pinhole sundial. This mechanical sundial is set for the latitude and aligned to the north. The top declination wheel moves a tube according to the date. The lower hour wheel moves the tube to track the sun projected through the long tube as a spot. Read the time on the scale on the lower wheel. The device is similar to a polar mounted telescope with declination and hour circles to track stars.

Digital Gnomon Update: Bob Kellogg reviewed recent advances on digital sundials from the Voshart Cube and the San Francisco Gnomon to a simple dial demonstrated in Bilbao using a series of vanes. Bob described a prototype last year in Victoria. This he reduced to practice using 3D printing to construct the model. The design is based on three segments each designed for 3 specific hours: 8 11 2, 9 12 3, 10 1 4. The digital gnomon is polar aligned. The sun shining through specific slots and the hour stencil indicates the time. The hour digit shows for the full hour with a quick transition, less than 2 minutes from one hour to the next. A bar of light indicates minutes advancing showing minutes elapsed.



Brasil's Newest Sundial: After lunch James Stegenga provided concrete examples of public sundials he built in Marataizes, Brasil. The first was on a pier at the beach. This horizontal sundial was cast concrete with an aluminum gnomon. The dial was quickly destroyed by vandals. The next dial at this location was similar but stronger. He left it covered to allow the concrete to gain full strength before exposure to the public. This dial has lasted longer. While James was building a dial a mature portly man in a speedo bathing suit asked questions about the sundial and eventually asked if James could design and build one for him. The man was a senior judge and wanted the dial for the courtyard of the courthouse. James proceeded with the project and built the dial, again using concrete with an aluminum gnomon. The dial plate is in the shape of Brasil. He had delays getting authorization and payment but all is well that ends well. Vandals don't hang around this area near the courthouse and police station.



Building Portable Wooden Sundials: Patrick O'Hearn enjoys working with wood in his business in Anacortes WA, from building and maintaining wooden boats to crafting portable sundials. He discussed the benefits and difficulties with wood, inlay techniques and weatherproof finishing. He showed pictures of several wooden dials he has designed and crafted including this flag dial. His current work in progress is a Navicula with inlaid brass latitude scale and zodiac plates.



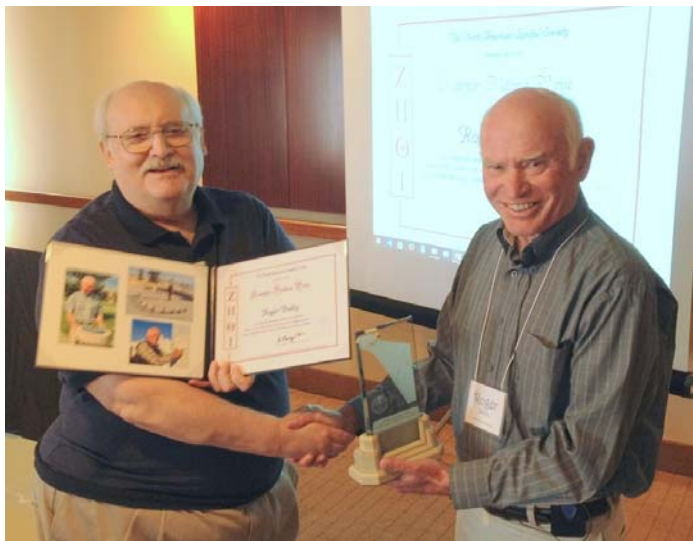
Referring Planes and Redeeming Foster: Fred Sawyer reminded us again that everything you need to know about sundials was published by Samuel Foster in the 17th century. The solution for reclining declining dials using the principle of horizontal equivalence was described by Jean Picard in 1682. Did Foster describe this earlier? In 1638 Foster published a solution using a different location but not the horizontal equivalent. Foster solved the problem with a Prosthaphaeretic Arc for a reclining direct east/west dial. This indirect method worked but did Foster know of the alternative solutions? Fred found references to Foster teaching alternative methods to classes in 1640 including the required spherical triangle. He quotes Foster's notes "I have assumed these Inventions in the last place, because they are more *commodious for animadversion*." Fred concluded that Foster had described the technique but other methods were less complex considering the use of log trig tables and the number of additions and subtractions.

How The Detection of Gravity Waves Improve Sundial Accuracy: On hearing of the detection of gravity waves, Bill Gottesman was amazed by the sensitivity of the laser interferometers capable of detection a difference of 1 billionth of the wavelength of visible light. The detector is extremely sensitive because it starts from a state of complete darkness. He asked “Can we adapt this principle to sundials to improve accuracy or create new designs?” Pinholes and slits can be used to sharpen the focus by reducing the umbra of a shadow to a point. His Renaissance Focusing Sundial reflects a focused beam on the helical scale allowing improved accuracy. During a partial solar eclipse, the image of the crescent sun is often observed under trees where the foliage provides multiple shadow sharpeners. Bill proposed an eclipse sundial project for August 2017 based on the angle of the points of the solar crescent changing rapidly at the time of totality. This he demonstrated at a Makers Faire in San Mateo CA during the eclipse May 20, 2012. <http://sundials.org/attachments/article/185/eclipsedial.pdf>

The Moon on My Pillow: Barry Duell described his experiment to determine when the moon would shine on his pillow. By measuring the window and distances to the pillow he determined the range of altitude and azimuth. From that and a lunar ephemeris he could predict the dates and time to observe the moon as he drifted off to sleep.

Sawyer Dialing Prize Presentation: This year Fred sawyer presented the Sawyer Dialing Prize to Roger Bailey “*for consistently showing the dialing community that all you need to know in life can be learned from studying sundials and for using that study to advance the theory and practice of dialing*”

That’s a Good Question: Roger outlined in his presentation how answering “good questions” led many of his sundial studies. These included his early work designing and crafting appropriate sundials for specific locations like the Battle Abbey Ice Axe sundial the Griffith Crest sundial. The question “How Long is my Shadow?” was the basis for analemmatic sundials for the Calgary Science Centre and Elliston Park. He worked with Helmut Sonderegger on a spreadsheet design program for analemmatic sundials that calculated the design data and answered the good question. That led to another good question “Can an Analemmatic Sundial show the location and time of sunrise and sunset through the year?” The answer was Seasonal Markers, points on the major axis of analemmatic sundials that worked with the date line on the minor axis to show when and where the sun rises and sets. These markers have been widely adapted and are often called “Bailey Points”. He answered the good question “Who can design a Ottoman Sundial?” by designing such a sundial for the Ottoman Garden at Missouri Botanical Gardens. This led to a design to replicate of the complex Ibn al Shatir sundial for the Analemma Society. As NASS secretary he continues to field good questions and provide advice on sundials.



The conference dinner began with a cash Bar at 7:00PM

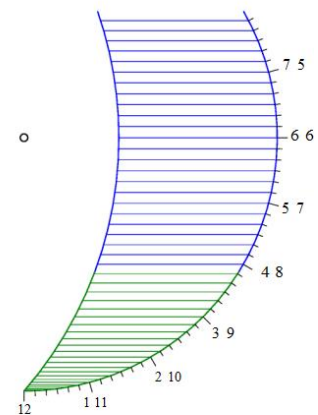
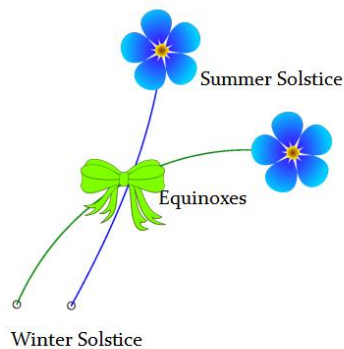
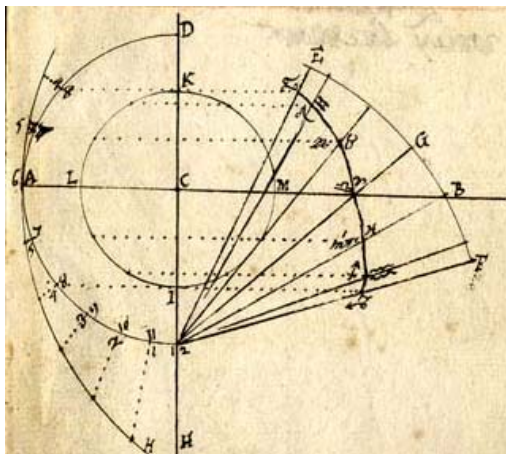
Sunday 26 June: The Board Meeting/Annual General Meeting started at 9:15

The Ball is in Your Court - Spherical Sundials:

Mark Montgomery presented the history of various forms of globe sundials. He found no references to Greek or Roman globe dials but concave dials and armillary spheres were in use over 2000 years ago. All are modeled on the fact that the earth is a globe, rotating each day at 15° per hour. Globe dials can tell time by the terminus between the lit and shaded sections. Gnomons at the poles, north in the summer and south in the winter, cast shadows to an equatorial hour band. There are many examples of moving perpendicular gnomons. Band, spot or shadow projectors are common. Mark then showed how to construct a mosaic globe sundial that uses the terminator to tell time.



A Limp Bouquet – Dialing in the Margins: Fred Sawyer described meeting Albert Waugh to see his collection, not of sundials but books, ancient books on sundials and related topics. Fred was not just interested in the books but the comments in the margins that said so much about the history of the book. One such note of interest (in a book from Fred’s collection) was in *Traité d’Horlogiographie* by Pierre de Sainte Marie Madelaine in 1701. This contained a note describing the construction of a self-



orienting altitude sundial. The concept was similar to the disc sundial aligned to the sun described earlier by Steve Lelievre. The gnomon was set on one line according to the date and the time read by the shadow on the other. Fred tried the graphical construction and found the dial was not very accurate, an approximation at best. Could the design be improved? Fred’s rehabilitation went through several stages including two curved lines for summer and winter, morning and afternoon scales and correction for longitude. The error was reduced to a maximum of ± 7 minutes on the worst day. This he offered as a limp bouquet in honor of a scribe from long ago and Albert E Waugh.

Time to Reflect: After the break Ken Clarke described the stages in his design of a sundial crucifix. This Christian cross is mounted in the polar plane. The crossbar serves as the gnomon casting the shadow onto the time scale on the shaft. Ken has built several versions. The first was a wooden cross. This was followed by a stainless steel version. Both had paper scales. The latest version pictured above is fabricated from 3” square



aluminum tubing, CNC machined and engraved at a local shop. He is now looking at a local Maker Space to do his own machining.

Sundials and Smartphones: Roger Bailey showed how a modern smartphone can replace much of the gear require for travel including a cellphone, camera, GPS, computer, wifi, maps, compass, guides, chargers etc. Travelling world wide with a suitable smartphone, he could stay in touch by phone and email, use the internet, manage bookings for travel and accommodations, navigate with maps and GPS, locate sundials and other points of interest, take pictures with locations recorded, measure the location and orientation of sundials, take notes, review documents, presentations and spreadsheets, all of this on a hand held pocket sized device. His choice was a medium priced international unlocked Android device, a Moto G, as this offered the required capability and value. The Google Android device offered the Google Apps including Gmail, Chrome browser, Drive, Maps, Docs, Translate, Books, *etc.*

For searching for sundials with the smartphone he found the following useful: Websites like NASS near home and SGC in Catalonia, the Sundial Atlas worldwide, Specific sundial maps in My G Maps, Open Street Maps. Similarly for sundial analysis he found the GPS, camera, compass and inclinometer apps useful.

Sol et Umbra by Gian Casalegno was the best specific sundial app he tested. The home page was a detailed solar ephemeris based on the GPS location and time. This included multiple time systems, solar, civil, temporal, Italian, Babylonian and Moslem. Option pages included: Sun Dial, that designed for a sundial for the location and orientation, Lighting that showed the position and path of the sun at that time, date, location and orientation, Sun Path that superimposed the path of the sun on the local camera view. Other options included setting position, time, date and preferences. Unfortunately, this great Android app is not available for iOS.

Other similar sundial apps included DesCAD and TpSol by Yvon Massé. LunaSolCalc was quite good for ephemeris data and details for the sun and moon at the local location and time. Useful travel apps included Open Street Maps and Wikiloc as both used off line maps. Booking.com and Air Canada were also useful apps for managing his travel logistics.

Anatomy of the Astrolabe: This presentation was a video of an Idea City Talk by Tom Wujec. This was an excellent introduction to the astrolabe outlining the function of the various parts and showing how to use it to determine so much astronomical information including time from the position of the sun. On the flash drive were drawings for the astrolabe components designed for various latitudes. These we could print and cut out to make our own astrolabes. Also on the flash drive was Sharon Gibbs' book on *Planispheric Astrolabes*.

NASS Flash 9: Bury and Blake: The flash drives provided this year to all full participants were unique, a wallet sized card with a 16 GB memory chip that folded out for use. The NASS initials and sundial logo were embossed on one side of the card, the Bury St Edmunds EOT intrinsic curve on the other. Fred explained the curve as a useful way to plot the equation of time. This version was drawn by Kevin Karney and featured curved lines for each quarter.

Fred then introduced us to one of the books included on the flash drive, a “commonplace manuscript book” from 1743 used to take notes on information of interest to the author. Much of the book is on “Dyalling”. The name John Pierce and latitude 42 – 25 are on the first page but Fred discussed the claim that James Blake, a deacon, surveyor and dialist in Dorchester MA, was owner/author.

Among the 17 dialing programs Fred featured *Orologi Solari* by Gian Casalegno and two programs by Helmut Sonderegger, *Sonne* and *Alemma*. The latest version of *Alemma* calculates Foster Circular and Diametral dials as well as various inclining reclining and declining elliptical sundials.

2017 St Louis Conference Preview: Plan now to attend the 2017 conference in St Louis MO August 19-22 to view the Great American Total Solar Eclipse on Monday August 21st. The 2017 NASS

conference will have a slightly different format to accommodate viewing the total solar eclipse. On Saturday 19th there will be pre-conference tutorials in the afternoon, before the registration. Registration will be Saturday evening. The lecture day will be Sunday, August 20th. The bus trip, including total eclipse viewing, will be Monday, August 21st. The last half-day of lectures will be Tuesday, August 22nd. As area hotels are already filling, it is important to make your hotel reservations now. The conference will be held at the Clayton Plaza Hotel, 7750 Carondelet Ave., Clayton, Missouri 63105/ See <http://www.cpclayton.com/>

Minutes of the NASS Annual General Meeting, June 2016

Roger Bailey, Secretary

President Fred Sawyer called the Annual General Meeting to order at 8:35, June 20th at the NASS Conference in Portland ME. Directors and Officers Present: Fred Sawyer (President and Editor), Art Paque (Vice-President), Mark Montgomery (Treasurer), and Roger Bailey (Secretary).

Roger Bailey recorded minutes of the previous annual meeting (June 2015). The minutes were accepted as distributed in the conference package and with *The Compendium* in Sept 2015.

Mark Montgomery reviewed the financial statements to May 31, 2016. The Statement of Financial Position shows cash and bank assets as \$59,330.89, prepaid conference expenses of \$4328.44 and \$147.00 as fixed assets for total assets of \$63,806.33. Liabilities included \$11,380 for the conference and \$7358.57 as unearned Compendium subscriptions. Net Equity includes \$34,440.84 unrestricted, \$7,000 for Adler Project and \$3626.92 for the Sawyer Dialing Award for a Total Net Equity of \$45,067.76. Mark summarized total NASS expenses for the past 5 years: about 95% of the expenditures were to support our core mission, 84% for the Compendium, 2% for the web, 2% for the Science and Engineering Festival, 3% for awards, and 2% for sundial projects. Depreciation on equipment to produce the Compendium and projector for the conference was 2%. Pay Pal fees and postage costs were ~5%.

Mark also noted we have a Public Information Book as required of not-for-profit organizations that includes founding documents, policies, and 3 years of tax records. By-laws and policies are also available on the web site. Policies include Logo Use, Conflict of Interest, Conduct of Officers and Document Retention. Bob Kellogg noted that we are a most transparent organization and Roger Bailey noted we are all volunteers with no remuneration.

Art Paque, Vice President and Membership Committee Chairman presented the membership report. Although the retention rate remains high, the total number is now 252, a net loss of 11 from last year, with 10 new members and 21 not renewing. Art presented the attached bar chart showing the retention. The electronic download is now the most popular format for the distribution of the Compendium with 100 electronic and 45 electronic and print for a total of 145. Print remains quite popular with a total of 128 members receiving the print format, 52 as print only, 45 as print and electronic and 31 as print and CD.

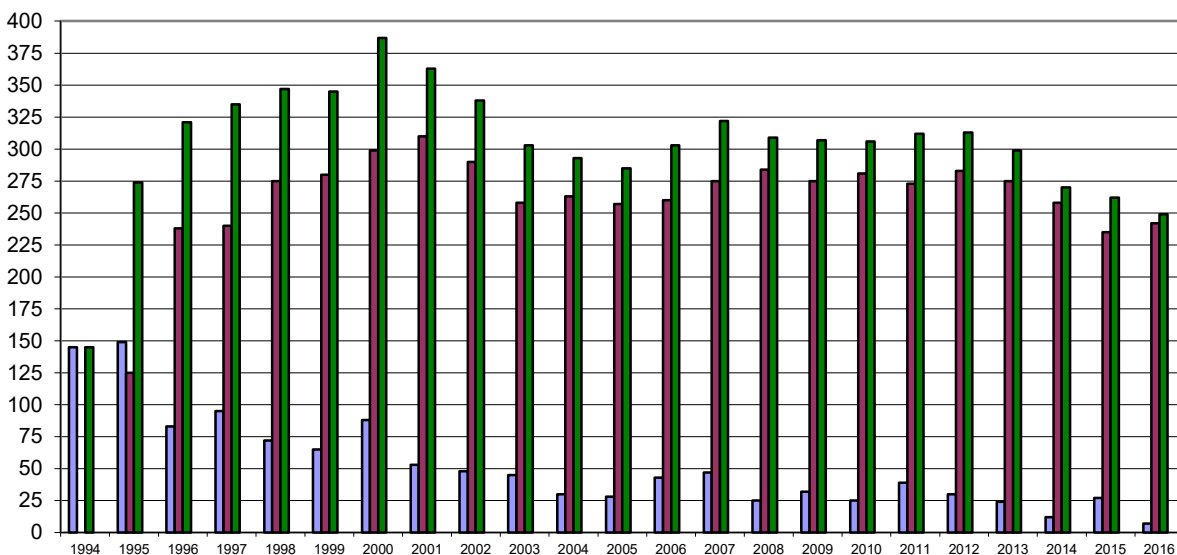
In a discussion on gaining new members, Dick Koolish asked about social media. He pointed out that the Antique Telescope Society found Facebook useful. Would a NASS Facebook page help to inform members and gain new ones? We currently use the NASS website that all can access rather than Facebook that pushes information out to specific followers.

Bob Kellogg gave a brief report on the NASS Sundial Registry. The current number of sundials registered is 825 with 28 new dials and 8 updates in the past year. A complete listing of all registered sundials is now available at the NASS website with links to pictures and descriptions. Registry PDF Reports are also available to download by geographical area. These can be displayed on tablet computers and smart phones. Bob encouraged us to take pictures and note the location of dials we find and send in the information using the online registration form or by email.

Bob Kellogg also presented the webmaster report. The website is based on the Joomla! content management system. The page format adjusts to show well on all types of devices, from desk tops to smart phones. The homepage shows Bob’s sundial blog now containing over 100 articles. Most new members and dial registrations come through the website.

There was no final report from the nominating committee this year. The terms for the President and Treasurer expire. The current incumbents, Fred Sawyer and Mark Montgomery will be declared elected if no further nominations are received by 1 July 2016.

The conference for 2017 is proposed for St Louis MO to coincide with the total solar eclipse on 21 August. Don Snyder the local host with Mark Montgomery assisting. Book now as accommodations are quite limited.



NASS Membership by year.

Bars show new, renewing, and total members, left to right for each year.