NASS Conference Retrospective: Seattle, August 2011

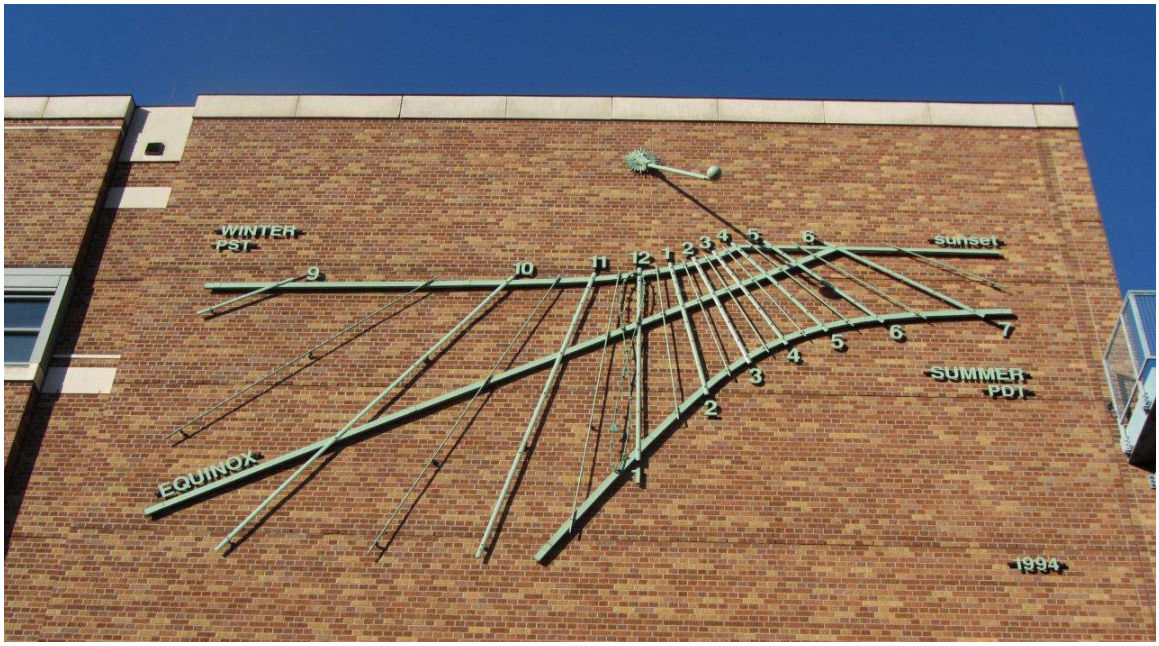
Roger Bailey

Reception: Thursday 18 September: We gathered between 4:30 and 6:00 pm in the University of Washington Physics and Astronomy Building to register and meet old friends and welcome newcomers. A total of 51 people participated.

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 allotted tickets on one prize or you could spread your tickets to increase your chances of winning something. Prizes included: a Nocturnal Geocoin; a reproduction Pewter Sundial; Sharon Gibbs' book *Greek and Roman Sundials*, Frank Cousins' book *Sundials: The Art & Science of Gnomonics*; Christopher St. J. H. Daniel's *Sundials* and Gerald Jenkins & Magdalene Bear's *Sundials and Timedials*; Mike Cowham's *A Study Of Altitude Dials*; Hester Higton's *Sundials: An Illustrated History of Portable Dials*; Stephenson, Bolt & Friedman's *The Universe Unveiled*; Winthrop W. Dolan's *A Choice of Sundials*; a recent reprint of T. Geoffrey W. Henslow's 1914 *Ye Sundial Booke*; two Perspex Sundials designed for latitude 40° by Hendrik Hollander; two sets of Sundial Note Cards; laser-engraved wood Differential Dialing Scales developed by Fred Sawyer; and copies of Ramona Maher's *Secret of the Sundial*, and Eugenia Desmond's *Shadow At Dunster Hall*.

The doorprizes were followed by a showing of Gino and Judith Schiavone's video on the design and construction of the Bowie Portal Sundial.

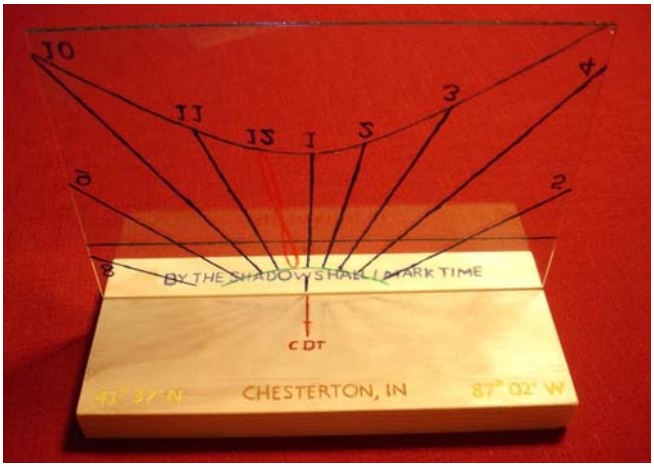
Then Woody Sullivan took us around the building to show his large vertical declining sundial on the southwest wall of the Physics and Astronomy Building. On this 1994 project, Woody Sullivan was project head and designer, Larry Stark, fabricator and Milhaly Turbucz, architect. The dial is about 30 ft by 20 ft and features an offset sphere as a nodus on the end of the gnomon.



***Presentations*:** *Friday August 19, 2011*

The presentations started at 8:00 am with welcome from Fred Sawyer and Woody Sullivan who then introduced the program chairman for the morning session, Dr. Frank King, BSS Chairman.

***A Stained Glass Spot Dial Project*:** Mark Montgomery described the theory and practical construction of a spot sundial - a gnomonless stained glass sundial where hour lines projected as shadows onto a spot to indicate the time. The hourlines are those for a vertical sundial designed for the latitude using a point gnomon. The design is inverted, reversed then painted and fused onto a piece of glass. The gnomon height is the distance the spot is out from the glass. When oriented facing south, the shadow of the hourlines move with the sun and tell the time at the spot. Mark described the design details including the effect of refraction and the techniques to fuse paint on glass.



Sundials in Corsica: Roger Bailey was up next to describe his search for sundials on the island of Corsica. This search took him to interesting remote areas not seen by most tourists, providing a good appreciation of the local culture and history of this rugged scenic island. Most of the sundials were on churches or in monasteries. The educated people with time and resources were often monks or priests. Corsicans are proud independent people but their rugged granite island with little arable land and resources is the poorest department in France. Many of the sundials are not well maintained but there were interesting exceptions where preservation of cultural artifacts was deemed to be important. The scenery and climate in Corsica attract many tourists from Europe.

A Stained Glass Sundial With Magnetic Gnomon: John Carmichael shared with the group his experience crafting a complex custom stained glass. A unique feature is the frog gnomon held in place with a powerful rare earth magnet. John showed us the steps to design the sundial: the artwork, the design of the individual stained glass pieces, the experiments to create the frog shaped

gnomon attached with a magnet in the dark spot of the sun pattern. This is a beautiful work of art and craftsmanship. Note the specific design elements, the frog, the fly and the shadow of the frog gnomon.

La Hire & Picard: While browsing an 1833 Dictionary of General Knowledge, Fred Sawyer came across the following statement in the topic of Horology, "M. Picard gave a new method of making large dials…and De la Hire … gave a geometrical method of drawing hour lines from certain points determined by observation". This statement got him thinking about La Hire and Picard and how they solved the fundamental problem of drawing hour lines from observed shadow points. Were their methods the same? The individuals were quite different: La Hire an artist and mathematician, Picard an astronomer and geodesic expert. La Hire developed a method based on perspective math and geometry. Picard used spherical trigonometry, calculation and precision in a technique that led to the modern approach to sundial design.

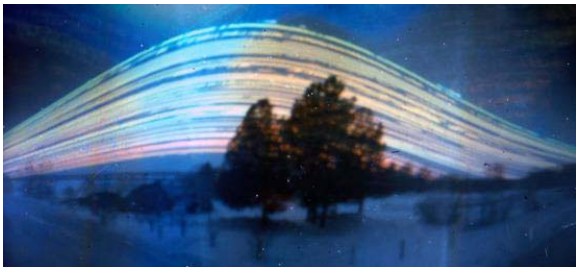
Workshop – Basic Macros in DeltaCAD: After the break, Robert Kellogg led us through a workshop on how to write a Basic macro for DeltaCAD. What I learned was to start with a good example of a well structured sundial program, like the recently updated NASS macro lessons. Most of the programming is defining the variables, to be used by specific subroutines to calculate and draw the lines. Bob stressed the need to document the steps so the logic can be understood not just by others but by the author returning to debug or add new features.

Cylindrical Sundials: Roger Bailey reviewed cylindrical sundials like the Shepherd's cylinder. Sundial determinants are the latitude, solar declination, time, altitude and azimuth. Knowing three, you can solve for the others for a shadow or spot of light projected onto a surface. Most ring and cylinder dials set the azimuth and measure the altitude to indicate the time. There are many variations of cylinders, rings and gnomons including spots of light. The final example before lunch was a beer glass sundial. Helmut Sonderegger's software "Sonne" is very useful designing ring and cylindrical sundials. On the sundial tour we would see an interesting cylindrical sundial at University Prep School designed by Woody Sullivan.

Sundials and Standard Time: After lunch Kevin Karney surveyed methods to make a sundial read standard time, specifically correcting for the equation of time. These methods included various tables and graphs, heliochronometers with shaped gnomons or analemma hour lines and finally mechanical systems to adjust the time scale. His presentation was produced with Google Sketch Up and formatted as a Quick Time movie to show the elements of the EQT and the operation of various gears, levers and cams to correct clock time.

Artists Who Use the Sun: Rebecca Cummins is an artist whose range of works enlists the history of optics, light and natural phenomena. Samples in the presentation included camera obscura in many shapes and sizes, objects casting shadows, apertures projecting sunspots, *etc*. The Montlake Library "Skylight Aperture Sundial" we would see on the tour is an excellent example of her work.

Planetarium Show: Before the break, Woody Sullivan took us over to UWA Planetarium to use this projector to show the paths of the sun, planets and stars.



Solargraphy: Art Paque introduced us to the topic of Solargraphy, the use of a simple pinhole camera to take pictures of the path of the sun through the seasons. Art provided each participant with a simple kit with detailed instructions to experiment with Solargraphy.

Elliptical Sundials – General and Craticular: Fred Sawyer again introduced us to a new level in the history and science of gnomonics with this ode to Samuel Foster. In 1654, shortly after his death, Foster's treatise on "Elliptical or Azimuthal Horologiography" was published, promising to be "wholly

new - representing the true Hours by the shadow made by the Axis of the World is but one of those infinite wayes which may be invented". The infinite ways depended on the tilt of the gnomon when the equatorial disc and gnomon are projected on a plane. For the typical analemmatic sundial, the gnomon is vertical and the substyle is the zodiac line. Tilting the gnomon changes the shape of the ellipse and gnomon projection. Tilted at the polar angle, the hour ellipse reduces to a standard gnomonic sundial, "representing true Hours". Tilted halfway from the vertical to the polar angle, the ellipse is a circle. This circular Foster sundial was by Lambert 1775, Ericson 1972 and Taylor 1975. Tilt more for rectilinear or diametral sundials. Tilt other ways; incline or decline the index. Foster even suggests the craticular form - a lattice. After examining craticular options for design, Fred introduced a new form of craticular polar sundial with an arbitrary elliptical gnomon. Fred ended as Foster did "Hitherto we have had the whole business of Elliptical Horologiography, so far as that more cannot seem to be thought of or required."

NASS Flash: Fred Sawyer then outlined the contents and use of the 4 GB flash drive given to all full participants. This contains all the conference presentations, a collection of sundial software and books, a selection of very useful utilities that run self contained from the flash drive. This makes the flash very useful for travelling. The books include the reference books by Foster, La Hire, and Picard that Fred referred to in his presentations.

Sawyer Dialing Prize Presentation to Helmut Sonderegger: The Sawyer Dialing Prize this year was awarded to Helmut Sonderegger of Austria "In recognition for his ongoing development of the dialing software Sonne and his many years of leadership in his national society." He also received the special edition Spectra Sundial designed for his location.

Sonne and Sundials: was Helmut's presentation following the award ceremony. In this he explained his interests in dialing, gave examples of his software and showed pictures of some of his sundial projects. He focused on the "Rheticus Memorial" sundial he designed in honor of Georg Joachim Rheticus, a native of Feldkirch and the first Copernican. Rheticus enabled "De Revolutionibus" to be published in 1543. The "Betstuhl" sundial by artist Hanno Metzler uses a cross aperture to project a cross onto the noon meridian line.

Seattle Sundial Tour: *Saturday, 22 August 2011*

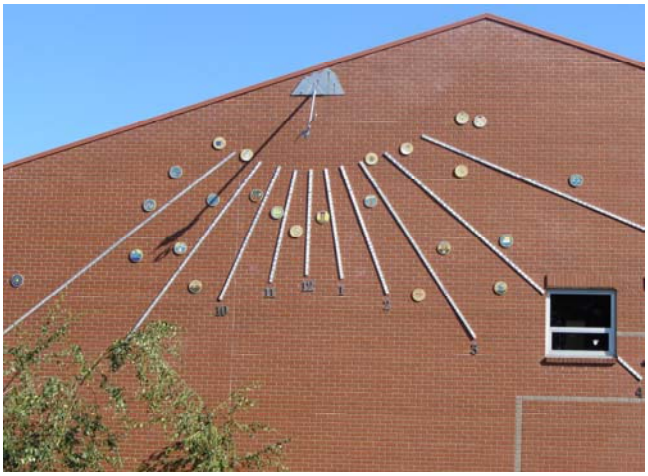
The sundial tour started on time from the University Inn with a large 56 passenger bus. The tour focussed on sundials added since the NASS tour in 1998. Woody Sullivan was involved in the design of most of these sundials.

Cowan Park Horizontal Sundial: N 47° 40.350 W 122° 18.758

Cowan Park is on Ravenna Blvd NE and Cowen Place NE. Near the playground is a large horizontal sundial with stainless steel gnomon, 8 ft. long. The gnomon is set on an inner concrete circle 13 ft in diameter within an outer concrete ring of 35 ft. The dial designed by Randy Nussbaum was constructed in 1999 with material from Boeing Surplus. The meridian line has markers for the solstices and equinox. The hour marks are on both the inner circle and the outer ring. The cardinal directions are also marked on the outer ring as magnetic bearings.

Olympic View School Vertical Sundial: N 47° 41.910', W 122° 19.260

At Olympic View Elementary School, 504 NE 95th St, a large sundial was installed in 1999 on the blank south wall. Woody Sullivan was the project head and chief designer. Others on the team were Melanie Olsen, (teacher), with parents Cynthia Livak (artist) and Bill Fetterley (architect). Puget Sound Energy fabricated and installed the sundial. The hour lines are aluminum strips; the five foot gnomon is stainless steel. The tip of the gnomon is the outline of an eagle, the school's mascot. Ceramic disks indicate the birthdays of the class involved in the project. Each student decorated his/her own birthday disc with appropriate art.



University Prep Academy Pillar Sundial: N 47° 41.207 W 122° 17.972

A bronze pillar sundial stands at University Prep Academy. This is similar to a shepherd's cylindrical dial except the orientation is fixed. The gnomon is aligned to the sun by the user. The time is read from the vertical the hour and date lines.

This interesting sundial was constructed in 2002. Ray Monnat, father of two boys at the school was the project leader, organizing and funding the project. Woody Sullivan, Professor of Astronomy at the University of Washington was the designer, assisted by Art Teacher Peggy Dow and Larry Stark who designed the turning mechanism. Charles Wiemeyer was the fabricator and added much to the design, providing both aesthetical, mechanical and practical advice.

The dial is 10 ft high with a maximum diameter of 2 ft. The dial is hollow inside and fabricated from bronze plate. The lines are formed from the individually cut hour/date line segments welded on from

Pillar Sundial

Ray Monnat and Woody Sullivan explain the dial

inside the cylinder. A lever at hand height is moved to rotate the gnomon to face the sun and provide a vertical shadow. The sides are conical for aesthetics and to minimize the effect of solar altitude through the seasons. The gnomon is in effect longer in the winter and shorter in the summer. There is a slot in the tip of the gnomon to provide a more accurate sun spot on the dial face. The motto is 'Who's Turning".

Epiphany School Vertical Sundial N 47° 37.066 W 122° 17.233

Epiphany School is an independent private school at 3611 E Denny Way in Seattle. The school, operating since 1958, built a new $20 million LEED qualified building in 2009. Woody Sullivan was the designer working with a design team from Lehrman Cameron Studios and Kevin Names of the Boiler Room as the fabricator and installer. The dial is 10 feet high, 18 ft wide with stainless steel hour lines. The stylized school emblem is at the base of the gnomon.

Rebecca and the noon sunspot

The hour markers are held in place by magnets and are easily removed. This facilitates moving the hour markers for the change from standard to daylight saving time. A longitude correction is built into the design, as the noon meridian is not vertical. Plaques explain how to read the time and date.

Montlake Library Skylight Aperture Sundial: N 47 38.427, W 122° 18.143

Timing for the sundial tour was determined by the solar noon to observe the noon mark at the Montlake Library Skylight Aperture Sundial. Rebecca Cummins installed this sun oriented art project in 2006 when the new branch library was built. The sundial art project uses coloured skylights in the ceiling of the Montrose Library to project spots of light throughout the library. This forms a solar aperture sundial in coordination with tack marks on floor by the main desk. The tacks in the carpet show the meridian line and circular spots for position of the sun on the solstices and equinoxes at solar noon. We were there right on time to observe a yellow circle of light transit the meridian line. Woody Sullivan and John Carmichael were the gnomonic consultants on the project.

Lines of the ceiling sundial

Sullivan Ceiling Reflection Sundial: N 47°40.617, W122°21.367
The highlight of the tour was a visit to Woody Sullivan's residence where we observed the complex ceiling reflection sundial in his renovated garage or "Man Lodge". A small circular mirror outside the south facing window reflects a spot of light on the multiple planes of the ceiling. Over 3 years Woody marked over 700 locations that enabled him to lay out a series of timelines including: Solar time, analemma, date, hours of daylight, commemorative dates, signs of the Zodiac and Precession, Azimuth and Altitude, Hours to Dawn, Transit sidereal time for two radio sources and compass rose, The dial was painted by a local artist. A marker was added for the date and time of the official dedication during the NASS tour. We toasted the sundial with an appropriate wine, "Wehlener Sonnenuhr" by Joh. Jos. Prum, a fine Mosel Kabinett from the German vineyard with a large vertical sundial.

Greenwood School Horizontal Sundial: N 47° 41.232, W 122°21.562
The final sundial on the tour was at Greenwood Elementary School, a large horizontal sundial with a sun aperture nodus. Hour and declination lines were painted on the concrete courtyard of the school below the aperture disc on a pole almost 11 ft high. Unfortunately a six ft chain link fence now separates the gnomon from the sundial face, obscuring the sundial.

For further information on Seattle's sundials, Woody Sullivan's Google Map and website are useful resources. See http://www.astro.washington.edu/users/woody/Sundials/Seattle/Seattle.html

Presentations: *Sunday August 21, 2011*

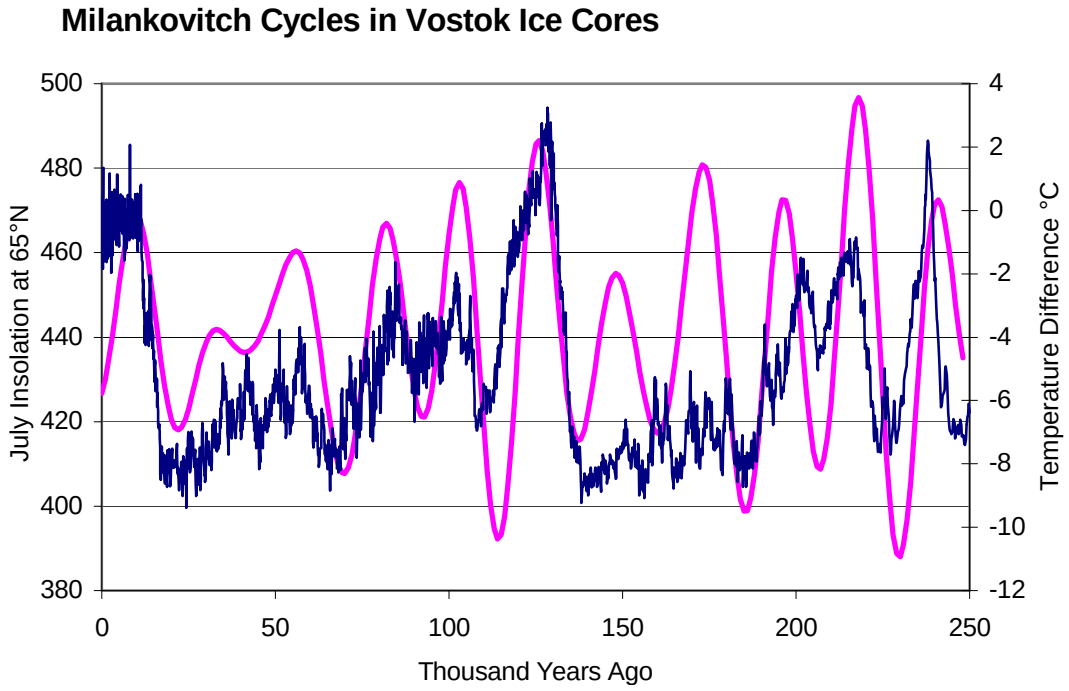
An Indoor Sundial using a Spherical Mirror: Tom Egan described his design challenge, to create an indoor tabletop sundial using an outside spherical mirror and a projected spot of light. This he accomplished with a convex mirror mounted on a pole and a couple of mirrors to direct the reflected image through a 1/8" aperture through the office window. The declination and hour lines were based on the sun's altitude and azimuth projected through the aperture from the mirrors. The ball mirror was not spherical, or even an oblate spheroid. Tom measured the curvature and approximated the shape with a 6th order curve. This gave a reasonably good fit for the predicted vs. actual track of the sun spot on the sundial design. He outlined the concept, hardware, testing, math and validation in interesting detail.

Making a Thirty Foot High Indoor Mirrored Analemma: Jim Evans described another reflected spot sundial project, a 30 ft analemma noon mark at the University of Puget Sound in Tacoma, installed in 2006. The spot light source is a mirror located in the skylight of the atrium of Harned Hall. The sundial has three hour lines: 11 am, noon and 1 pm. The analemma provides a correction for clock time, including a longitude offset and equation of time for the date and declination. There are curves for the solstices and a bar for the equinox. The stainless steel strips are marked. The date is on the analemma, time on the solstices, declination on the meridian and the zodiac on the hour lines.

Analog Calculators For Architects and Photographers: Tom Kreyche's interest in the Oughtred and double horizontal sundials led him to similar horizontal instruments, including analog calculators to determine solar positions. This presentation covered three analog calculators developed and marketed in the US since WWII to architects and photographers. The first was the Sundicator, perhaps the first modern, scientific, inexpensive widely-marketed

sundial, developed by Harold Dodd and Thomas Spencer marketed through the 1970's. The next was the Sun Angle Calculator by Libby Owens Ford, the glass company. This is still available for $25 from the Society of Building Science Educators as the Pilkington Sun Angle calculator. The third is the Solar Pathfinder, calculator on a tripod, under a plastic dome. This is marketed to architects and solar energy designers to analyze site shading. Reflections on the dome show the shading from adjacent trees and buildings.

Sundial Science and Global Climate Change: Roger Bailey provided a change by showing pictures of glaciers and went on to show how slight changes in the earth's orbit initiate and end ice ages. Sundial science is all about the earth's orbit and changes over time in the tilt (obliquity), shape (eccentricity) and precession (changes in axis alignment). The Milankovitch Cycles add together the cycles in obliquity, eccentricity and precession and examine the solar heating at high northern latitudes. If the snow and ice do not all melt in the summer, glaciers form and grow. This affects the amount of sunlight reflected and the average temperature so the growth of glaciers accelerates until half the northern continents are covered with ice. This has happened at regular intervals for the last 80 million years. We are just recovering from the advances of the last 100,000 years and glacial advances 25,000 and 12,000 years ago. The ice cores from Greenland and the Antarctic correlate well with the Milankovitch Cycles of insolation in July at Lat 65°N.



Heliodon and Torquetum: Len Berggren introduced us to two instruments to show the position of the sun. He demonstrated their use with wooden models he had built with co-author Brian Albinson. The Heliodon is an instrument to show architects how the sun shines on a building through the day and year. The basic components are a rotating horizontal base with second base plate tilted at the co-latitude. For this setup the sun moves up and down to simulate the seasons. A third base that tilts for the declination allows the light source simulating the sun to be fixed. The torquetum looks similar but is an observational instrument, rotated 180° from the heliodon. The torquetum allows the observation of celestial bodies in any of the three astronomical co-ordinate systems (horizon, equatorial, ecliptic) at a given moment. The instrument has a long history as a useful tool to avoid the rigorous mathematics to reduce sights to different coordinate systems.

The Margaret Stanier Memorial Sundial: Frank King described the design and construction challenges with the Memorial Sundial for Margaret Stanier at Newnham College, Cambridge. Dr Stanier was the long time editor of the BSS Bulletin, a Fellow at Newnham College and had a particular interest in Mass Dials that showed 12 unequal hours from sunrise to sunset. This dial shows "Unequal Hours with a Difference". Frank determined that tilting the gnomon and choosing hour angles to give a best fit resulted in a reasonably accurate and fitting design.

Short Informal Presentations rounded out the program.

Ken Clark showed the display he set up at the Public Library in Lititz PA on National Astronomy Day focused on solar observing and sundials. On the table with the NASS banner, Ken had quite a collection of sundials including his "rocket Boys" sundial.

I. Smith and W. Sullivan showed the video passage of the shadow on different days on the University of Washington Sundial. The images were taken by an automated digital still camera, then edited and converted to a video format. The view from across the street was impressive but some trees and foliage need to be trimmed.

Will Grant presented his "Pilgrimage to the Kentucky VietNam War Memorial". This monument designed by Helm Roberts shows the date and time of the ultimate sacrifice of over 1100 people from Kentucky serving in VietNam.

Woody Sullivan gave an update on the Mars Sundial, in service long after its best before date.

Barry Duel showed the stair shadows at the Toshogu Shrine in Japan and pointed out the specific alignments no longer apparent or recognized.

Jeff Kretsch and Charles Olin described an interesting project on orientation by astronomic survey and GPS to determine the exact declination of a wall at the Observatory Park run by the Analemma Society.

Masato Oki presented the investigations by his colleague Haruyuki Okuda of the Japan Sundial Society and the Institute of Space and Astronautical Science on focusing spherical sundials. A glass sphere focuses the sun's rays very close to the sphere, too close to be useful except to record sunlight traces burned in paper like the Campbell-Stokes sunlight recorder. A sphere of different refractive index within a sphere can extend the focal length and create interesting unusual sundials.

This year's conference program was full and well appreciated by those in attendance. See you next year in North Carolina.