

EVENTS CALENDAR

(unless otherwise noted, planetarium shows and classes are at the Edwin Ritchie Observatory, Battle Point Park)

SEPTEMBER

SEPTEMBER 5 ● New moon

SEPTEMBER 14 7:30 p.m. Planetarium Show and Stargazing

SEPTEMBER 19 ○ Full Moon (4:13 a.m.)
Introduction to Amateur Astronomy Classes begin, Thursdays 7:30 p.m.

SEPTEMBER 22 Autumnal Equinox (1:44 p.m. PDT)

OCTOBER

OCTOBER 4 ● New moon

OCTOBER 12 7:00 p.m. Planetarium Show and Stargazing

OCTOBER 18 ○ Full Moon (4:38 p.m.)
Penumbral Lunar Eclipse

OCTOBER 21
Orionids meteor shower peak

NOVEMBER

NOVEMBER 1 Venus at Greatest Eastern Elongation

NOVEMBER 3 ● New moon
Hybrid Solar Eclipse (Africa)
“Daylight Saving” Time ends
Taurids meteor shower peak

NOVEMBER 7 Advanced Astronomy Classes begin, Thursdays 7:30 p.m.

NOVEMBER 9 7:00 p.m. Planetarium Show and Stargazing

NOVEMBER 15
William Herschel’s 275th birthday

NOVEMBER 17 ○ Full Moon (7:16 a.m.)

NOVEMBER 28 Comet C/2102 S1 (ISON) at perihelion

DECEMBER

DECEMBER 2 ● New moon

DECEMBER 11 Annie Jump Cannon’s 150th birthday

DECEMBER 14 7:00 p.m. Planetarium Show and Stargazing

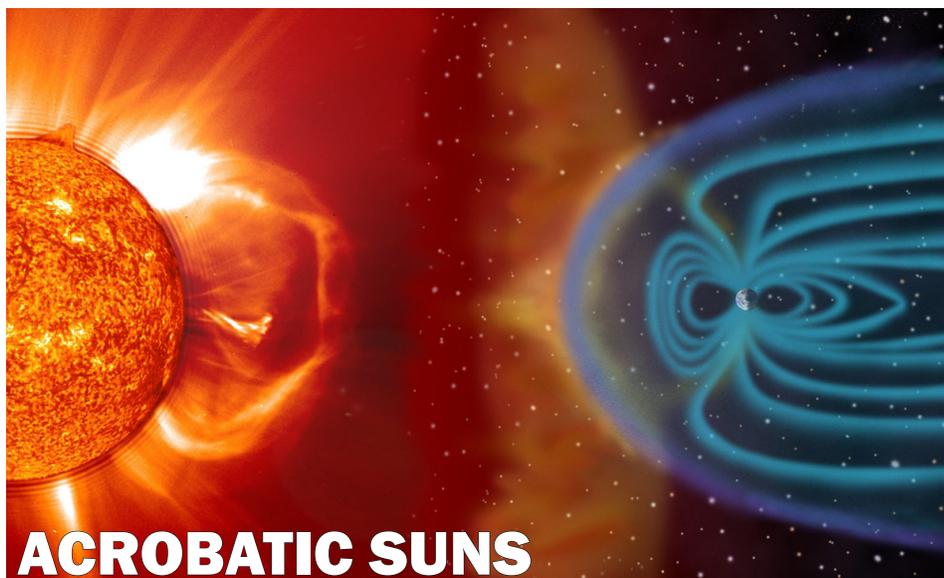
DECEMBER 17 ○ Full Moon (1:28 a.m.)

DECEMBER 21 Winter Solstice (9:11 a.m.)



Quarterly

www.bpastro.org Bainbridge Island, WA



ACROBATIC SUNS

Earth's Protective Magnetic Fields (graphic courtesy NASA)

CALENDAR NOTES: Magnetic compasses often come with correction charts. Though counterintuitive, Earth’s North Pole and her magnetic north do not coincide. Here on Bainbridge Island compasses miss true north by about 16 degrees, currently. The actual offset constantly changes. In fact, geologic records show that Earth’s magnetic field can flip completely over. This wouldn’t hurl us off the planet; but it certainly could cause disruptions. During the transition, increased exposure to cosmic rays would be one potentially dangerous side-effect. Fortunately Earth’s pole reversals are relatively infrequent, happening only once every million years or so.

Our sun flips considerably more often. Right now the Sun is in mid-pirouette, with the North Pole already switched. The South Pole is expected to follow by year’s end. This polarity shift should mark the apex of Solar Cycle 24. So far 24 has been a disappointingly weak cycle, at least for those who like to observe sunspots and aurora. Perhaps the upcoming polarity flip will bring an uptick in auroral activity.

Homemade magnetometers should be able to detect this polarity flip. Even a compass can see some of the short-period changes the Sun induces in Earth’s magnetic field. An assembly of a laser pointer affixed to a bar magnet, hung by a thread and allowed to spin inside a jar — like a high-wire circus performer — makes a somewhat better magnetometer: <http://www.eaas.co.uk/news/magnetometer.html>. For *Back to the Future* fans, electronic “flux” magnetometers using solid-state detectors may prove more fun, and easier to monitor via computer. As we approach both stormy solar and stormy winter weather, indoor observation methods have their appeal.

While the weather allows, a distant sun in Delphinus is putting on quite a show. On August 14th a nova was discovered photographically by a Japanese amateur astronomer, Koichi Itagaki. Nova Delphinus 2013 has held steady around magnitude 5 for almost two weeks now (as this article is being written). It is believed the progenitor star was 17th magnitude. That’s an increase in brilliance approaching 100,000 times. By comparison (and thankfully) our Sun’s output varies by only about 0.1% over its eleven year cycle.

Calendar Notes con't on page 2



Steve Ruhl President's Message

Over the past five years, the BPAA board, along with artist Bill Baran-Mickle, has worked towards installing a sundial just north of the observatory. Our intention is to create a public timepiece that blends art and science and provides science education for visitors at the park.

Frank Petrie's article on page 3 describes our current Indiegogo campaign: <http://www.indiegogo.com/projects/battle-point-sundial-project>. We have focused fund raising efforts over the past several years on this sundial and I believe we are very close. We would appreciate any help you can give us. The dial is a great legacy for the association to give to the community. Sundials reach individuals at a very visceral level. In our technological



BPAA Sundial model (photo by Nels Johansen)
driven world, we are abstracted from the primary relationships between us and our solar system. The sundial renews those relationships at a most fundamental level.

This fall, Dave and I are offering the courses "Introduction to Amateur Astronomy," beginning September 19, and "Advanced Amateur Astronomy," beginning November 7, Thursday evenings at 7:30, if we get enough people to sign up in time. Over and over again, too few people sign up by the Parks Department deadline, a couple of days before the class begins, and we have to cancel. Then a bunch of

people try to sign up on the day (or a few days after) the class starts and it is too late. If you are interested, please sign up early — and bring a friend. We have a lot of fun with these classes. We tailor them to the individuals in the class so if you have some questions or your own new theories, bring them!

On a personal note, my daughter Sarah graduated from BHS last June and is headed off to UW this fall. We just finished setting up all of her courses for her first quarter. One of them is "Introduction to Astronomy." I am a proud dad.

Any member who is planning to observe can invite others to join in by sending an email to bpaa@yahoo.com. To join our email group, send an email with your name to bpaa-owner@yahoo.com and we can enroll you. If you want to have web access to the messages and files, you can join the Yahoogroups by clicking the register link for new users on <http://groups.yahoo.com/>. Request to join at <http://groups.yahoo.com/group/bpaal>. The system will send us a message, and we'll approve your request after we verify your membership.

Calendar Notes con't from page 2

No one really knows what either of these two suns will do next. Fortunately both are easy to observe. Our Sol is occasionally visible during daytime. To aid observing, we are planning to erect a bowstring sundial (see articles above and page 3). As for the more distant changeling, Nova Delphinus 2013, by curious coincidence, the constellation Sagitta, The Arrow, aims almost straight at it. At mag 5 the nova is just barely visible to the unaided Bainbridge Island eye (although mag 6 is more often regarded as the normal eye's reach, Seattle's light pollution robs that last magnitude from us). Both suns are worth watching.

Another uncertainty is comet C/2102 S1 ISON. Hope remains that comet ISON will put on a fine show. Early speculations posited that Christmas Day would be its peak visibility. Unfortunately, recent brightness reports show it a couple magnitudes fainter than predicted. The once effusive commentaries about the coming great comet are growing quieter, including mine. For this year's first newsletter I sung its praises. Now I merely hope that I will be able to see a smudge with my 100mm refractor.

That's how my stargazing usually goes. What I see may not be what I planned; but I love what I find. I catch a comet, an occasional nova, a few meteors, an auroral evening (St Patrick's Day was my vote for this year's best). I am thrilled by these sights. I am also thrilled when I learn that an amateur spotted Nova Delphinus. It's nice to know that humans still have a place amidst all the computerized surveys and giant apertures. Personally, I do not attempt any such discovery. But I do applaud.



Annie Jump Cannon

Accolades are particularly due one woman this winter: Annie Jump Cannon. For most of the world her 150th birthday will fall on the memorable sequence, 11/12/13. Here, in America, where we use the questionable and rather clumsy month-day-year format, it is less ambiguous to call the celebration December 11th. What she should be remembered for is the stars. Cannon personally classified the colors of over 200,000 stars, and is responsible for the still widely used OBAFGKM classification scheme that describes the amazing costume changes stars display. She was a truly great astronomer.

Whether you are just a casual observer or plan to dance in Ms. Cannon's footsteps, we invite you to join us at any of our always-open-to-the-public Planetarium Show and Stargazing sessions. See you there!

— Cheth Rowe



Sundial Fundraising

Fundraising for the Battle Point Sundial Project is off to a great start. On August 13 we launched an Indiegogo crowd-funding campaign with an end date of September 22. Our fundraising goal is \$17,000. You can read about the sundial, watch our video, browse our perks, and make a donation at

<http://www.indiegogo.com/projects/battle-point-sundial-project>.

Even though we've gotten a few large donations, we need many, many small donations to make our goal. Please visit the site and make a donation in any amount before the campaign ends September 22nd. And tell everyone you know about the campaign. Email them the indiegogo link. You'll never know who's a sundial supporter unless you ask!

Our project has received national recognition: The North American Sundial Society is featuring us on their website (www.sundials.org) and has donated \$1,000. Additionally, *Sky and Telescope*, The Planetary Society, Space.com, and Phil Plait ("Bad Astronomy") have tweeted about our sundial.

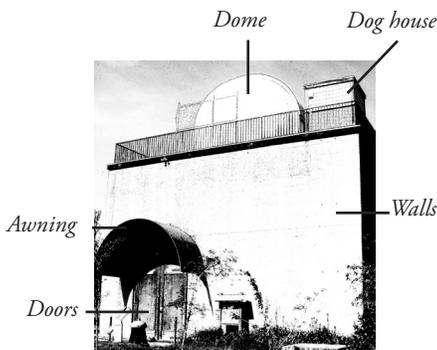
Closer to home, Greg Scheiderer blogged about the sundial at *Seattle Astronomy*, <http://www.seattleastronomy.com/blog1/> and mentioned us several times on Twitter. Articles appeared in *The Bainbridge Review* and *The Kitsap Sun* (<http://tinyurl.com/kitsapsunsundial>), and *The Bainbridge Islander* featured us on the cover.

So don't hesitate! Visit our Indiegogo project page and support the sundial. Let all your family, friends, coworkers and acquaintances know! Mention our awesome perks, like a private planetarium show or sundial earrings.

If we reach our goal by September 22nd, we'll be able to complete the sundial by early 2014 and have a dedication celebration in the spring. I'm looking forward to that and I hope you are too! — *Frank Petrie, Sundial Project Manager*



Seattle Astronomy



Summer Repairs and Improvements

In the last newsletter, I listed several projects that we needed to complete this summer. I am glad to announce we've finished almost all of them!

We washed the inside of the dome: a huge improvement — I didn't realize how dirty it was. A big job but the work crew got it done in one day, including

the rubber roof.

The largest, and the one job I was most concerned about, was re-siding and rebuilding the dog house. I was not looking forward to the disrepair we would face. The roof had been leaking every time the rain came down. After bandaging up the siding and corner boards and roof of the dog house for years, to no avail, I was determined to replace the siding, corner boards and dog house roof this summer.

We took the siding off of the south and east sides and found that the corner boards were installed wrong, the flashing on the corners was missing, the underlayment was torn in many places, there was no overlapping of siding and corner boards, the rubber roofing was laid on top of the siding instead of under the flashing of the siding, and all the flashing was installed backward. It was not possible for the roof not to leak!

We fixed it right with new Tyvek, siding, roof, corner boards, then primed everything and painted the siding and

trim. We still have to put two coats of elastomeric paint on the dog house door, which is in rough shape and close to the end of its life.

I've repainted the front door classic navy blue. The Parks Department painted the building grass green and the front door wet dirt brown (my color names). I still have to do some clear caulking on the center panels to seal the doors, and would like to decorate the central panels further with star art. Any volunteers for help with that? Fine art painting is not my speciality!

The remaining jobs are to repair the dome shutter tracks, which are rotten and leaking, and to seal the awning over the entry doors. Maybe we can get two more months of summer.

I can truly say the Observatory looks very nice, and thank you all for helping out.

Keep looking up! And see you all at the next Star Party! — *Nels Johansen*

The Sky is Falling!

Astronomy 0.001

Zodiacal light produced by sunlight reflecting from cosmic dust. (Paranal, Chile)

SEEING STARS: Suppose someone you met on the street told you that you could expect a load of dirt to be dumped on your property tomorrow, that you couldn't refuse delivery, and that no one would ever haul it away,?

"So how much?" you might ask.

"Well, the entire load is about 110 tonnes per day," they'd reply. "But don't worry, you'll only get your share."

"Ah — What's a tonne?"

"A bit more than 2,000 pounds."

Before you could express your dismay, they'd go on to say "And you'll be getting the same the next day, and the next. And you can't stop it. Ever."

Then they'd smile and say "But it's only dust. Cosmic dust. Invisible to the naked eye. It's arriving all the time."

Cosmic dust is mostly meteoroid particles between 50 – 500 micrometers in size. If you had 10,000 of these

the past few decades, using modern telescopes and spacecraft, scientists have been able to study this material up close and use it to learn about the origins of the universe: what elements were created first, how stars and planets are formed and how they end, why and how they are different, what their ages are, and what the universe was like long before our own solar system was formed.

Thirty-six years ago this August, NASA sent two spacecraft to Jupiter and Saturn, and then to Neptune and Uranus, so that they could send pictures of the planets back to Earth. Voyagers 1 and 2 not only did that, they have kept on going, past Pluto, and now are over 102 AU (Voyager 2) and 125 AU (Voyager 1) from the Sun. This is beyond what was expected to be the furthest reaches of the Sun's influence. But still they are recording its magnetic field and solar wind. Neither Voyager is quite out into interstellar space yet, but they're farther away than any man-made object has been before, and the information they're sending back helps scientists understand more about the origins of cosmic dust particles.

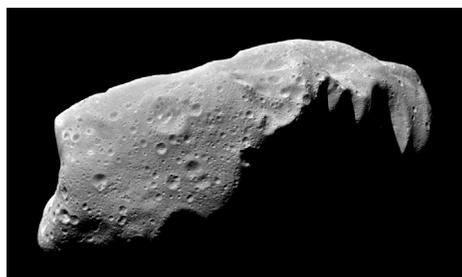
Through this recent space exploration, we have learned that cosmic dust comes from four sources: comets, asteroids, the Kuiper Belt and stars. Each type differs from the others in chemical and isotopic composition.

Comet dust has silicates, hydrocarbons and water ice; the silicates have complex mineral compositions with grains of pyroxene and olivine (an iron-magnesium-silicate). Comet dust can reflect sunlight so well it appears to glow.

Asteroid dust is much like the dust from carbonaceous chondritic meteorites. Japanese scientists last year brought back some dust from the asteroid *Itokava* and found it was mostly olivine like igneous rocks on Earth. Meteorites can be bigger than dust, but fortunately for us pieces the size of the large (59 ft.) chondrite asteroid that exploded above Chelyabinsk, Russia last February 15th are rare.



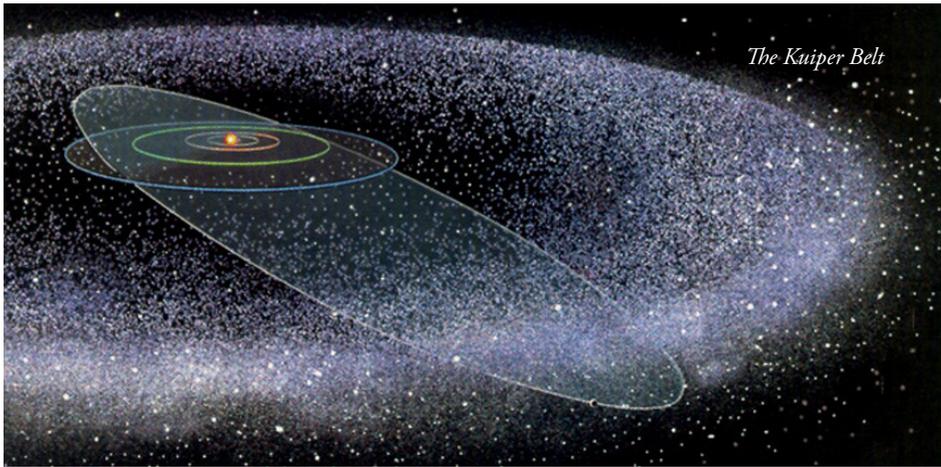
Comet C/2006 P1 (McNaught) (Victoria, Australia 2007)



Asteroid Ida (Courtesy NASA)

particles you still wouldn't be able to see them in a teaspoon. But they're big enough for scientists to study.

Years ago, cosmic dust was considered a nuisance. In some areas of the sky it was so thick that astronomers couldn't see through it. In the 1970s, Dr. Don Brownlee of the University of Washington learned how to reliably distinguish extraterrestrial dust particles from the earthly sort stemming from volcanic eruptions, earthquakes, wind storms and our own pollution. Over

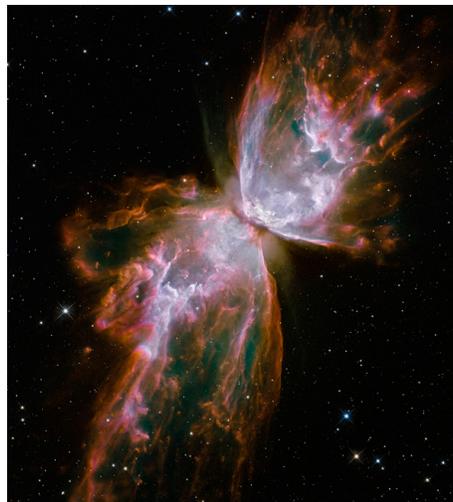


Kuiper Belt dust objects are mostly frozen methane, ammonia and water. They are thought to be stuff left over from the formation of the Solar System. These same chemicals also show up in the dust from the more frequently seen comets that circle into the inner Solar System from the Kuiper Belt.

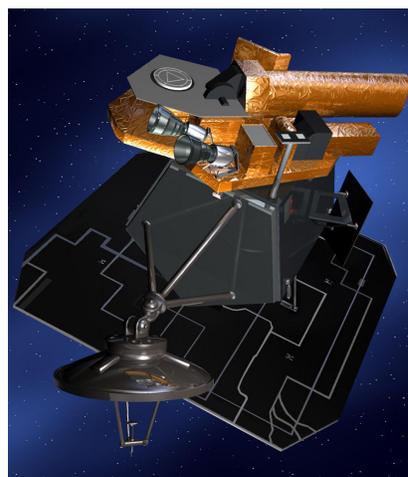
Stardust is largely made of refractory minerals left over from the formation of stars. Some of it also comes from exploding supernovae. It may have condensed from the gasses of individual stars before elemental isotopes were distilled; their spectroscopic wavelengths help scientists identify the star they came from. Scientists believe that some of it predates the formation of the Solar System. They have looked at isotopic ratios in stardust grains and studied their nucleosynthesis, finding silicon carbide, graphite, aluminum oxide, and aluminum spinel that had to have been formed when the universe was much hotter and younger than it is now. This has helped them learn how hydrogen fused into helium and how other elements in the universe were formed.

The dust particles can reveal how long they've traveled to get to us, whether they've been hit by solar wind ions or galactic or Solar cosmic rays. For example, the particles that come from the Kuiper Belt show a much higher density of such strikes than those coming from the asteroid belt between Mars and Jupiter. When scientists know what kinds of minerals the dust particles carry and where they're from, they have clues to the temperatures of the particular asteroid or planet, to whether water is present or not, and to how the body was formed.

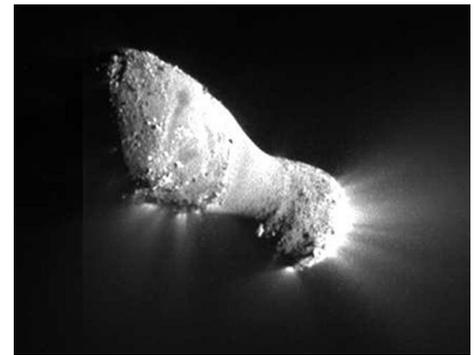
In November 2010 NASA's Deep Impact probe got close enough to the small asteroid Hartley 2 to get a picture of it, looking like an unshelled peanut. Most of the dust in its tail is carbon dioxide which originated before the solar system was



Butterfly Nebula (Hubble 2009)



Deep Impact Space Probe (courtesy NASA)



Asteroid Hartley 2 (courtesy NASA)

formed. This comet carries the same ratio of heavy water and regular water that the Earth does, and thus could be the kind of comet that supplied our water in the first place.

In September 2012 scientists reported that they had found polycyclic aromatic hydrocarbons (something like benzene) in the dust that had gone through interstellar space. These molecules could be precursors to amino acids, and ultimately to the very early forms of life.

So much stuff falling on us! But even so the Earth isn't getting bigger; rather we're losing a bit more than we're gaining. While that 110 tonnes of dust is falling on us every day, we're losing 137 tonnes of hydrogen and helium out into space. And we can't chase after them any more than we can throw away the dust.

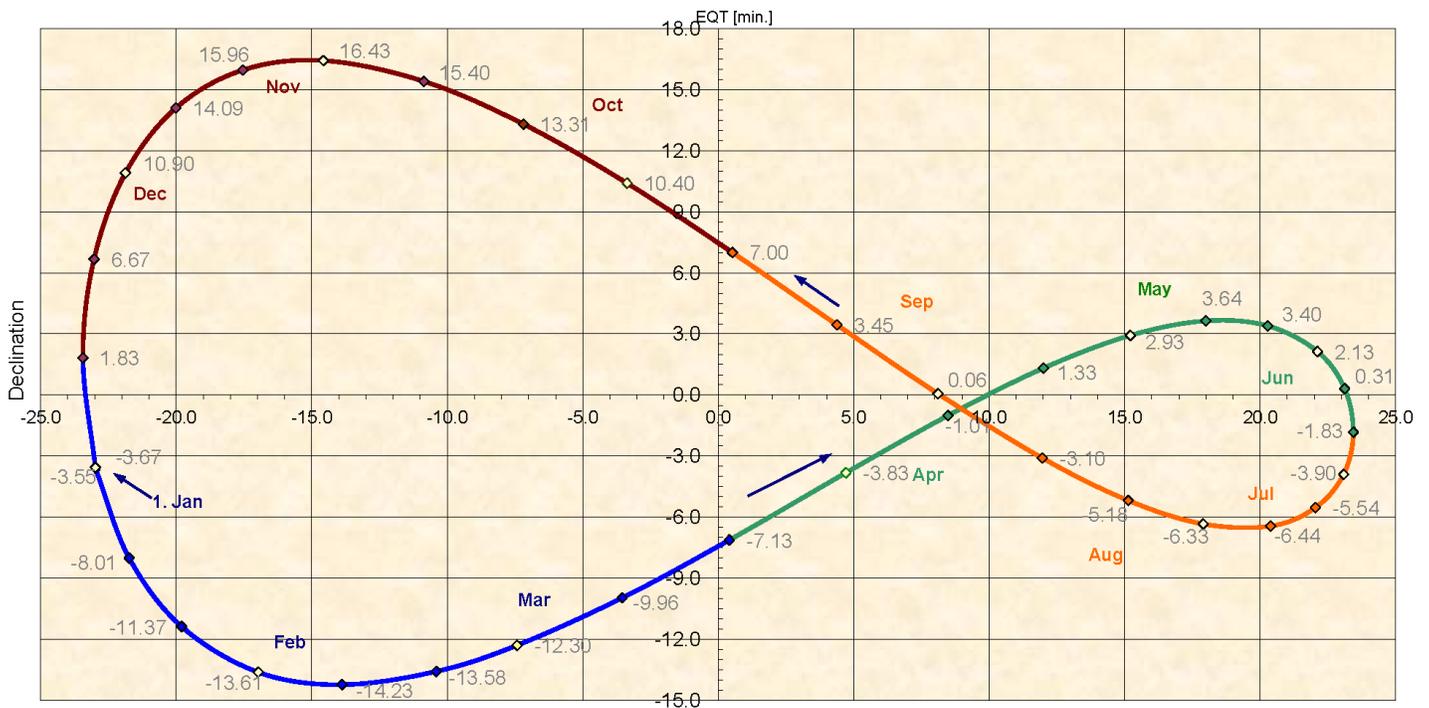
Are the scientists worried? Not particularly. Not yet. They say that our total loss for the year is less than 0.0000000000000001% of our total mass.—*Anna Edmonds*

Thanks to Susan Eyre for editorial help.



The dust of the Horsehead Nebula (Hubble)

A Bainbridge Island Analemma



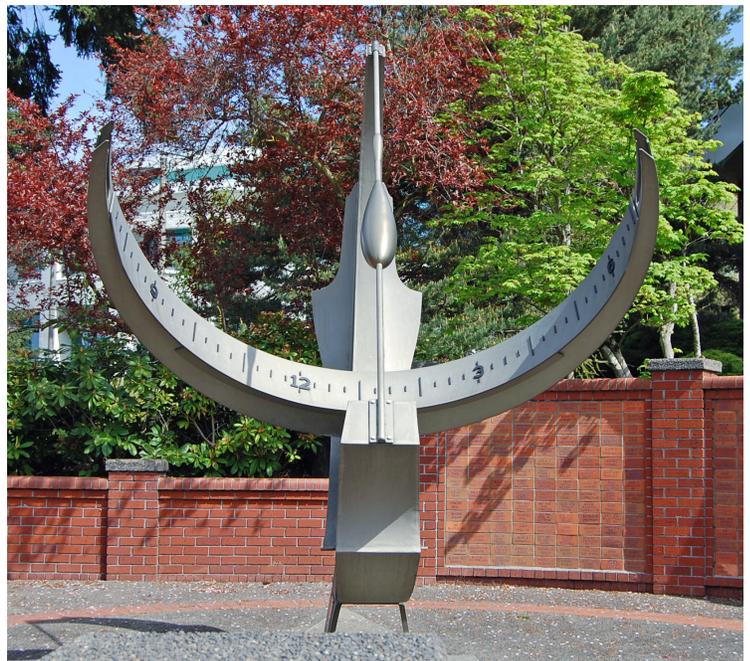
The Sun's position in the sky at the same time of day changes slowly but surely with the seasons. An analemma curve like the one above records that change, which is caused by the tilt of the Earth's axis and the elliptical shape of its orbit around the Sun, and varies with geographical location.

This change in the Sun's position also affects the gnomon's shadow on the face of a sundial. The "Equation of Time" (EQT on the midline of chart above) measures the difference in minutes between the Sun's seasonal position and clock time.

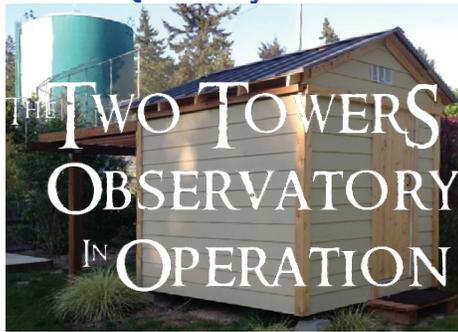
On a bowstring sundial, a three-dimensional model of the local analemma shape can adjust the gnomon's shadow so that the sundial gives correct clock time in all seasons. BPAAs astronomers intend to install such an analemma on their sundial.

First, we generated a local analemma, illustrated above, using established formulas. Now, we must translate this shape into three dimensions, position and scale it, and finally, create the physical analemma in metal.

We are now studying how to best produce the analemma shape, employing equations, spreadsheets, CAD programs, and expert advisors. The results will be completely local, and, we anticipate, totally beautiful.— Vicki Saunders



Clark College, Vancouver, WA sundial with a three-dimensional analemma on the gnomon. Reading the appropriate edge of the analemma's shadow gives the correct time.



In the Summer 2013 BPAA newsletter, I detailed the construction of my backyard observatory. Here, I display some results from my labors. The new observatory has multiple advantages:

- No set-up time.
- I can incrementally improve polar alignment each night until it is “good enough.”
- The whole system allows a high level of repeatability: calibrations stay consistent over a longer period.
- Fewer barriers to observing on a marginal night: If the results are not so good or it clouds over, I can easily try again the next night. Previously, if it clouded over after a couple of hours after I spent a couple of hours setting up a precise polar alignment, you might have heard certain mumbled expletives.

After a few rounds of alignment and calibration, the astrophotos started flowing. The photos on this page were taken with my trusty AT106. This has been my primary telescope for about three years. Its 690 mm focal length combined with my SBIG ST-8300 yields a field of view of about 1.5 x 1 degrees.

After a making few photos with the 106 and verifying that the new observatory was behaving correctly, I acquired a 10" 2000 mm focal length telescope. The field of view with this telescope and my camera is about 0.5 x 0.35 degrees. This provides a significant increase in magnification and it pushes to the limit what is visible here on Bainbridge Island. You could collect more photons in a larger telescope but I do not think you could get more detail. The photos on the following pages are from this new telescope.



May 13 and 14, 2013
 Total exposure time: 180 minutes.
 (twelve 300-second exposures through red, green, and blue (RGB) filters, binned 1x1)

M65 on bottom left, M66 on bottom right and NGC3628 along the top. These galaxies are in Leo. I particularly like the visible dust in all three galaxies.



June 14, 15, and 16, 2013
 Total exposure time: 180 minutes.
 (eighteen 300-second L binned 1x1, six 300-second RGB binned 1x1)

M106 in the constellation Canes Venatici. The galaxy is estimated to be 22 to 25 million light years distant. This galaxy is an active galaxy glowing in radio waves and x-rays. It is one of the closest examples of a Seyfert galaxy, where vast amounts of gas are flowing into a super-massive black hole.



June 30, 2013

Total exposure time: 176 minutes.
(eight 600-second H-alpha binned 1x1,
twelve 300-second L binned 1x1,
six 120-second RGB binned 2x2)

M27, the Dumbbell Nebula. This planetary nebula is estimated to be about 1400 light-years distant. The central star is the largest white dwarf known. This exposure is full color with highlights of the Hydrogen-Alpha emissions that are internal to the planetary nebula.



NGC 7048. This planetary nebula is in the constellation of Cygnus. Distance estimates range vary between 1,800 to 6,200 light years. It is nearly circular and its size is 1 arc-minute in diameter. This allows a good measure of the resolving power of this telescope.

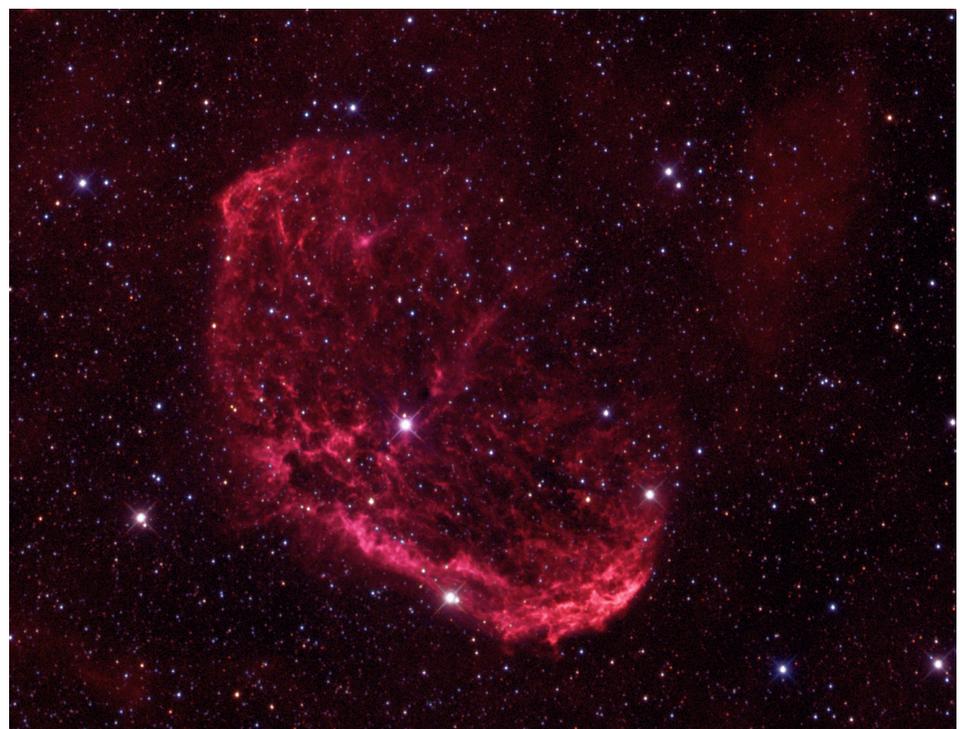
July 8 and 9, 2013

Total exposure time: 270 minutes.
(nine 600-second H-alpha binned 1x1,
twelve 300-second L binned 1x1,
eight 300-second RGB binned 2x2)

NGC 6888, the Crescent Nebula in the constellation Cygnus. My nemesis. I have shot this object many times but it is difficult to get a satisfying image from my site. The object is about 5000 light years distant. At its core is WR 136, a Wolf-Rayet star that is rapidly losing mass as its surface boils away. WR stars are massive stars in the end stages of their evolution.

June 30, July 1 and 2, 2013

Total exposure time: 385 minutes.
(eighteen 600-second H-alpha binned 1x1,
twenty-three L binned 1x1,
six 300-second RGB binned 2x2)





NGC 7635, the Bubble Nebula in Cassiopeia. The Bubble Nebula is an emission nebula with the “Bubble” created by the solar wind from a young star about fifteen times more massive than our Sun. The nebula is about 11,000 light years distant.

July 6 and 7, 2013

Total exposure time: 280 minutes.

(ten 600-second H-alpha binned 1x1,

twelve 300-second L binned 1x1,

eight 300-second RGB binned 2x2)

NGC 7331, galaxy in the constellation Pegasus. This galaxy is about 40 million light years distant. It has roughly the same size and structure as our own galaxy, the Milky Way.

August 4 and 5, 2013

Total exposure time: 170 minutes.

(sixteen 300-second L binned 1x1,

six 300-second RGB binned 2x2)



Stephan’s Quintet, a group of galaxies in Pegasus. It is challenging, though possible, to see this group of galaxies through an eyepiece at a dark site. The Quintet is about a degree from NGC 7331. The largest galaxy (lower left in the grouping) is NGC 7320. It lies about 39 million light years away in the neighborhood of NGC 7331. The remaining galaxies, NGC 7317, 7318a, 7318b, 7319 and 7320c, are actively interacting and are about 210 to 340 million light years distant. These galaxies interact and are in the process of merging. The Quintet was discovered in 1877 and is the first compact galaxy grouping discovered.—*Stephen Ruhl*



July 20, 21, 22, 28 and 29, 2013

Total exposure time : 300 minutes.

(thirty 300-second L binned 1x1,

ten 300-second RGB binned 2x2)

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