Summer 2012
Issue 98

Quarterly

www.bpastro.org Bainbridge Island, WA

Events Calendar

(unless otherwise noted, all events are at the Edwin Ritchie Observatory, Battle Point Park)

JUNE

June 4 ○ Partial Lunar Eclipse (max 4:12 a.m. PDT)

June 5 Transit of Venus! 3:05 p.m.–Sunset: Transit gazing through solar telescopes

June 9 8:30 p.m. Planetarium Show *All Things Saturn* and Stargazing

June 19 ●

June 20 Summer Solstice (4:09 p.m. PDT)

June 29 Pluto at opposition

June 30 Mercury at greatest eastern elongation

JULY

July 1 Kennedy Space Center's 50th anniversary

July 3 ○ (11:52 a.m. PDT)

July 4 Earth at aphelion, Grand Old Fourth in Winslow

July 1 Telstar's 50th anniversary

July 14 8:30 p.m. Planetarium Show and Stargazing

July 18 ●

July 19–21 Table Mountain Star Party

July 20 Man on the Moon Day

AUGUST

August 1 ○ (8:27 p.m. PDT)

August 5 Curiosity lands on Mars

August 11 8 p.m. Planetarium Show and Stargazing

August 12 Perseid meteors peak

August 13 Venus occulted by Moon

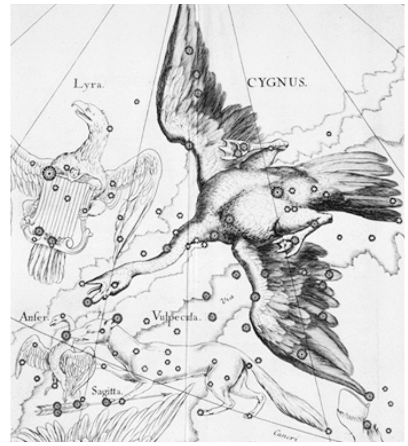
August 14–19 Oregon Star Party (25th year!)

August 17 ●

August 31 ○ A "Blue" Moon (6:58 a.m. PDT)

Calendar con't page 2

All Aboard for the Milky Way



The Constellation Cygnus

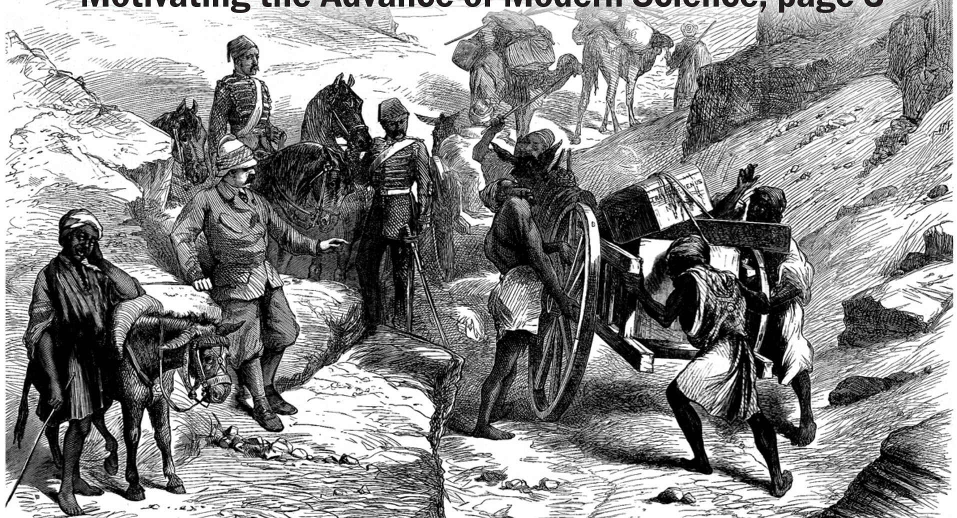
CALENDAR NOTES: Summer = stars! Read this as modern programming code: the equals sign does not mean equivalence; it means assignment. Because it seems somehow summer got assigned all the stars. After the sparse and dreary skies of spring, the blessed arrival of summer brings the delightful mix of (hopefully) balmy, clear nights and the countless jewels of the celestial masterpiece, our own galaxy, the Milky Way. Astronomical statisticians report that a few thousand stars are the most we can see without optical aid. Any Bainbridge Islanders attempting verification might have topped out at a few dozen this spring. So it is with great delight that we welcome summer. And give thanks that we can at least see some of the Milky Way's billions from Bainbridge.

Although man has spent millennia naming summer's overhead river of stars, and all the constellations, and it would seem the job has been satisfactorily completed, I cannot resist the temptation to make a few of my own associations. Summer—and Cygnus in particular—seems to feed this urge. Maybe it's the heat. Now I've tried; but I can not mentally turn the Milky Way's glorious Cygnus, the Northern Cross, into swan. To me her brightest star, Deneb, is so obviously head, not tail. Moreover, the shimmering bodice that twirls below Deneb and the Northern Coalsack seems more appropriate garb for queen than the king-into-swan of legend. Instead, I see Cygnus as Rock and Roll goddess, an angel singing from on high. Part of the credit

Milky Way con't page 2

The Transits of Venus:

Motivating the Advance of Modern Science, page 3



Captain Browne superintends the conveyance of scientific materials up the Mokattam heights. (Engraving from London Illustrated News, December 12, 1874)

Calendar *con't from page 1*

SEPTEMBER

September 8 7:30 p.m. Planetarium Show and Stargazing

September 15 ●

September 22 Autumnal Equinox (7:49 a.m. PDT)

September 24 Pallas at opposition

September 29 ○ (8:19 p.m. PDT) Uranus at opposition

Any member who is planning to observe can invite others to join in by sending an email to *bpaa@yahoogroups.com*. To join our email group, send an email with your name to *bpaa-owner@yahoogroups.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/bpaa/*. The system will send us a message, and we'll approve your request after we verify your membership.

for this vision goes to Lyra. There at the angel's feet lies the lyre, the modern sky's one musical constellation. But I don't stop there. After all, few performers use the lyre nowadays. In my imagination Vega is pilot light and the rest of Lyra a compact, travelling, ever-ready amplifier powering my sweet angel's celestial voice. Do you see her too?

Though there may be argument about the gender of certain constellations, there can be little doubt that meteors are male. One of the astronomical highlights of the year, August's Perseid meteor shower is noteworthy not only for its reliability, but also for its high-percentage of meteors with persistent trains (perhaps 45%!). This year's peak favorably coincides with Perseus's maximum elevation in the early hours of Sunday morning, news likely to prod plenty of Saturday night revelers to turn their eyes skyward for this high-speed and long-lasting treat. Unfortunately a waning moon degrades the best early morning hours; but there should still be plenty of action. And even if Sunday morning doesn't work for you, remember that the Perseids remain strong for several days both before and after Sunday's peak, and active for most of the month of August.

My most memorable Perseid show was not my favorite. Being a gung-ho amateur, I owned an astronomical auto, a car with a star, a very used and much loved '63 Mercedes. In search of slightly darker skies to catch the shower I drove a short distance up a logging road just off Highway 101. Yes, logging roads and sedans aren't the best match; but that wasn't the problem. This particular year moonlight interfered until 1 a.m., so I hiked up a bit farther, stretched out a blanket, and grabbed a quick nap. Suddenly I was rudely awakened by a cop car shining blinding, night-vision ruin all over my plans. I was livid. Then they told me. Apparently someone at a party nearby had rolled my prized, red leather German vehicle straight over the cliff—over and over and over—right onto 101. Totalled goes without saying. Thankfully no one was hurt. For some years after I considered the Perseids dark, bad luck. I still watched 'em. But I pretty much stopped mixing cars and stars. Eventually I found a more nuanced view. I will drive for stars; but I never forget the moral: be very careful out there in the dark (and don't park near parties)! I still count this as the hardest fallen star I've ever seen.

Sadly, NASA's star cars are equally kaput. NASA reports July 1 as the official 50th anniversary of the Kennedy Space Center, or at least of its formal renaming as Launch Operations Center. (The Kennedy part of the nomenclature came one year later, deservedly bestowed amidst the hellish week following JFK's tragic assassination.) Regardless the name, this Florida complex has hosted the launch of every manned U.S. space flight, and, for that matter, every (known) manned space flight beyond Earth orbit. So it is tremendously disheartening to consider that NASA has abandoned what I always considered its core responsibility, to loft mankind to the heavens.

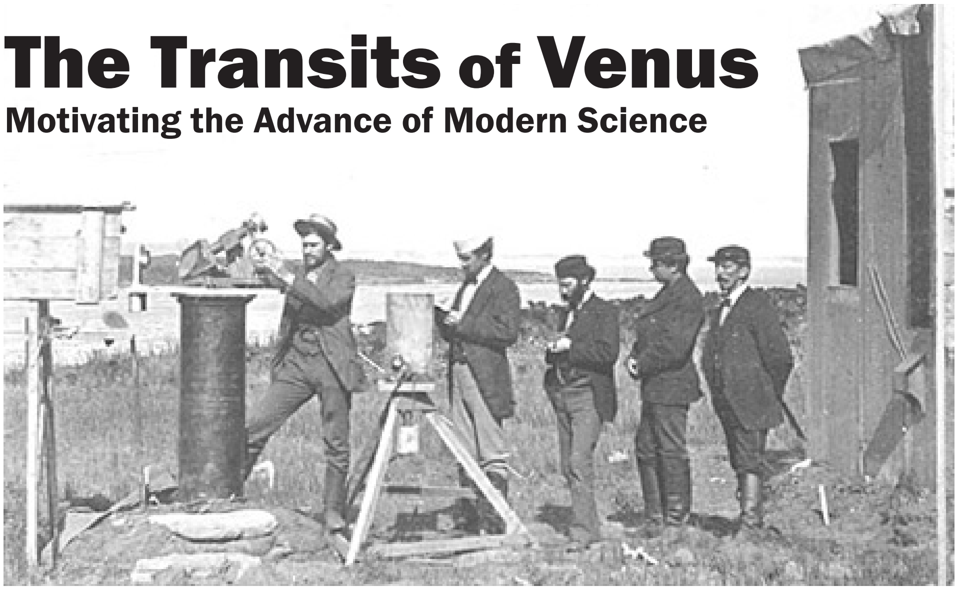
The positive spin is we may finally be witnessing the birth of a successful commercial spaceflight industry. Thanks to code. Elon Musk of PayPal and Tesla fame seems to have found a good use for wealth. Currently his SpaceX Falcon 9 is set to deliver goods to the Space Station in mid-May (slightly after these notes are being written). Although this brave private space vehicle will be pilotless, it will still launch from America's premiere spaceport, Kennedy.

America's premiere holiday, its birthday, July 4th, is not often thought of as an astronomical event, in spite of its dazzling shooting "stars" and folks up late at night looking toward the heavens. Yet, by curious coincidence, it does, more-or-less, mark a significant astronomical event, aphelion, the moment of greatest distance between Earth and Sun. When I first heard this I thought it not just counterintuitive, but plain wrong—if the sun's at its most distant, how can summer be so hot? The answer, of course, is that Earth's 23° tilt more than offsets the 3% difference in distance. But I never forgot the surprise of the paradox; and with the same zeal that engenders my willingness to craft new constellations, I make new associations, too. Perhaps the curious coincidence of our country's birthday falling on Earth's orbit's "highest" point means our country is divined by birthright to take man the farthest from Sol—all the way to the stars. OK, birthright smacks more of astrology than astronomy. And yes, we first need to explore Mars and plumb Europa's oceans and mine the asteroids. But I think mankind needs frontier; and I, for one, don't want us to stay stuck forever in our own backyard.

Whether or not your backyard is conducive to astronomy, remember that our observatory is. You are always welcome. Check the calendar and join us at our next Planetarium Show and Stargazing. And repeat the mantra/code: *ad astra*—to the stars!—*Cheth Rowe*

The Transits of Venus

Motivating the Advance of Modern Science



U.S. Naval Observatory staff at the observing station on Kerguelen Island, 1874. Courtesy of the U.S. Naval Observatory Library

Science in Europe at the dawn of the Renaissance consisted almost entirely of the study of Greek thought translated by Latin and Arab scholars. Much of the Arab work was transmitted to the Western world via the Iberian Peninsula when parts of it were controlled by the Muslims (711–1492). European science, if one could call it that, consisted of finely dissecting the fragmentary and often mistranslated works of the ancient Greeks. Observation of the physical world as a starting point for scientific enquiry was not part of the medieval European scholastic process. Aristotle assumed an Earth-centered universe as modeled by the Greek astronomer, Ptolemy. Aristotle's philosophy came to dominate European scholastic thought.Thomas Aquinas (1225-1274) used the philosophy of Aristotle to reconcile the logic of ancient Greece with revealed Christian faith. Aquinas' approach, which came to dominate Roman Catholic thought, included the Earth-centered universe of Ptolemy.

Nicolas Copernicus challenged the accepted cosmology with his publication of *On the Revolutions of the Celestial Spheres* in 1543. He showed that the motions of the planets could be explained by a Sun-centered model with the planets and the Earth rotating around it. He also imagined the stars at such vast distances that they appeared stationary throughout the annual orbit of the Earth around the Sun. His work spread (but was not necessarily accepted) across Europe, aided somewhat by the Protestant Reformation sparked in 1517 by Martin Luther in Germany.

The true nature of the universe was hotly debated. The great Danish astronomer Tycho Brahe (1546-1601) resolved to measure the positions of the planets to an accuracy never before achieved, with the goal of determining whether the universe was Sun-centered or Earth-centered. The Lutheran cleric Johannes Kepler (1571-1630) analyzed Brahe's data, coming to the conclusion that the planets followed elliptical paths around the Sun, with the Sun at one focus of the ellipse. Planetary orbital speeds varied, moving faster as they approached the Sun and slowing as they moved away. He also showed that a simple mathematical relationship existed between planetary orbital periods and their relative distances from the Sun.

Meanwhile Galileo in Catholic Italy pursued his scientific investigations without the relative freedom of the Reformation enjoyed by his northern European Protestant colleagues. He did enjoy one great advantage—the telescope. With it he discovered the moons of Jupiter and the phases of Venus. He felt these observations confirmed the Copernican view of the universe. Kepler and Galileo were working independently and coming to the same conclusion.

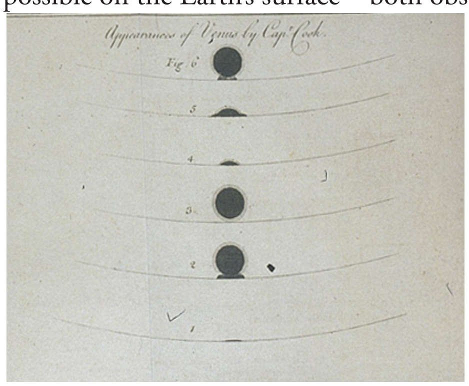
The orbits of Mercury and Venus lie between the Earth and the Sun. Mercury, being the closest to the Sun, orbits once every 88 days and so overtakes the Earth about three times a year. Venus orbits in 288 days and overtakes Earth about once a year. If all three planets orbited in the same plane then Mercury and Venus should be visible as shadows crossing the sun several times each year. These events could be called "transits" of the Sun by the planet. Kepler realized that the orbits of the planets were inclined slightly to the orbit of the Earth and so transits would occur only when the inner planet overtook the Earth when the Earth was near the point where the inner planet crossed the orbit plane (ecliptic) of the Earth. Kepler was able to predict that transits of Mercury and Venus would occur in 1631. He noted the great importance of observing these transits because they would help refine the orbital parameters and angular size of the planet in question. Unfortunately, the transit of Venus in 1631 was not visible in Europe; a French priest, Pierre Gassendi, observed the transit of Mercury and published his results.

Meanwhile England was contributing little to the advancement of astronomy until a young Lancashireman, Jeremiah Horrocks, appeared on the scene. Horrocks was born about 1618 in a small village near Liverpool. He entered Emmanuel College, Cambridge at age 13. This was not particularly precocious for the time—the BA was normally awarded at age 17 and the MA at age 20. He had an immense fascination with astronomy, which he seems to have taught himself, noting that he read twenty-four European authors on the topic. The absence of English authors is not accidental. Little was available in English on the work of Galileo or Kepler. Horrocks repeated many of the measurements of Galileo and Kepler, expanding on them to discover that the Moon, like the planets, followed an elliptical orbit with the apsis (line connecting perigee and apogee) of its orbit precessing over time. (see *http://tinyurl.com/moon-precession*.) Horrocks attributed this precession to the Sun, anticipating Isaac Newton by many years.

On October 26, 1639 Horrocks realized that a second transit of Venus would occur less than one month later. Kepler had not anticipated that transits of Venus occur in pairs separated by eight years. The next pair would not occur again until 1761 and 1769. Horrocks commenced his vigil Sunday morning, November 24, 1639 (4 December in the modern Gregorian calendar), projecting the Sun's image through a telescope onto a screen. He did not have a sufficiently accurate orbit for Venus to predict the precise time of the transit. He says he was called away on urgent business for three hours and returned just in time to record ingress of Venus on the sun about 3:15 PM. He was able to observe the first three hours of the transit before sunset. Horrocks' friend and astronomical correspondent William Crabtree observed and recorded the transit in Manchester, just a few miles away.

Horrocks wrote up his observations and outlined his entire view of astronomy and the philosophy of science in a work titled *Venus en sole visa* (Venus in the Sun). He completed this work in 1640 and died 3 January 1641 of unknown causes, age 22. His work circulated in manuscript form but was not published in England until 1673 by the Royal Society. Isaac Newton acknowledged his debt to Horrocks for his theory of the Moon.

In 1716 the second English Astronomer Royal, Edmund Halley, emphasized the significance of the 1761 transit of Venus for determining the distance to the Sun. Kepler's laws provided a relative set of planetary distances to the Sun—relative to the distance of the Earth to Sun. For example, Venus is about ¾ of the Earth's distance to the Sun. Halley proposed a method for using the time interval of the transit of Venus across the face of the Sun to infer the actual distance to the Sun. His method required at least two observers separated north and south as far as possible on the Earth's surface—both observers able to see the entire transit.



Observations by James Cook made at King George's Island [Tahiti] in the South Sea from the Philosophical Transactions of the Royal Society of London, *vol. LXI, 1771.*

Led by astronomers in France, astronomers in England and across Europe began preparing for the 1761 transit. Expeditions from nine different countries, including the colony of Massachusetts, set off to 117 locations all over the globe, north to Siberia and south to the Cape of Good Hope. These efforts constituted the first great international scientific effort—undeterred but significantly challenged by the ongoing Seven Years' War between France and England. The transit of 1769 was pursued no less enthusiastically, unhindered this time by warfare between the principal participants. Observers from eight countries ventured to 77 locations ranging from Hudson's Bay to Tahiti.

Both transits provided vehicles not only for astronomical observation but for scientific observation and exploration. The most famous observer, Captain James Cook, was sent first to Tahiti for the transit and then to circumnavigate the globe on his first great exploratory voyage. French observer Chappe d'Autoroche produced some of the best observations, first in Siberia (1761) and then in Baja California (1769), where he lost his life to fever after the transit. He wrote extensively of his voyages and observations. Guillaume Joseph Hyacinthe Jean-Baptiste Le Gentil de la Galaisiere brought the longest name and worst luck to the transits of 1761 and 1769. He was absent from France over eleven years wandering back and forth across the Indian Ocean, eventually as far as Manilla, only to have the first transit occur while at sea and the second obscured by clouds. He redeemed himself by making many scientific observations and writing of his journeys.

1874 observatory of Ernest Mouchez on Ile Saint-Paul in the Indian Ocean. Courtesy of the Institut de mécanique céleste et de calcul des éphémérides.

The transits of 1874 and 1882 were still of interest, though better methods were being exploited for finding the distance to the Sun. The United States, led by astronomers from the US Naval Observatory, sent teams. Photography was used for the first time.

Radar measurement has now determined the distance to the sun within meters. Now the slight dimming of a star by the transit of a planet provides a valuable clue in the search for planets around neighboring stars. Look for the transit on June 5, 2012. It will start about the same time locally as it did for Jeremiah Horrocks in December 1639. Think how our world compares to his and how it changed with each successive transit. How will the world look to our great-grandchildren when they observe the next transit in 2117?

—Paul Middents

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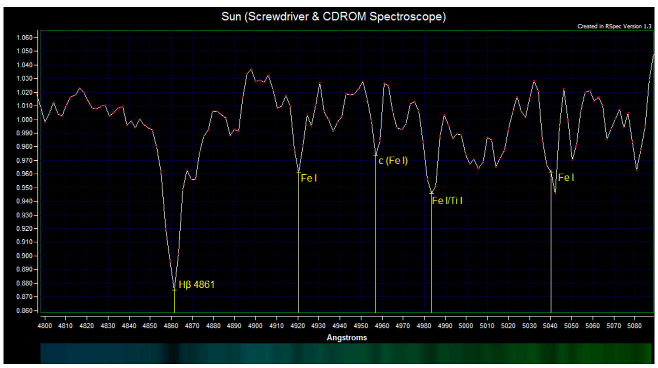
Steve Ruhl
President's Message

I'm amazed by how much the quality of amateur astronomy equipment has increased in recent years: now some amateur astronomers are able to collaborate with professional astronomers to push scientific knowledge further; others confirm known scientific results. That is not a bad thing. Many astronomers are driven by intellectual curiosity or just a desire to determine if they can "see it." And they verify the scientific principle that these discoveries are repeatable.

Every once in a while I need some inspiration. For a few years, my inspiration has been coming from a set of imaging conferences in Portland. This year's "Imaging the Sky Conference 2012" demonstrates the incredible variety of what can be observed in the night sky by amateur astronomers with modest equipment. A sampling:

David Haworth has taken up spectrography. He demonstrated how you can get solar spectrographs from a screwdriver and a piece of a CD-ROM. He has taken this science a little further. He has studied spectra of various star types. This allows him to identify the chemistry and temperature of these stars. He also demonstrated how he took a spectrograph of a supernova in M101 last year and showed that it had no hydrogen. This is called a Type 1a supernova and is used as a "standard candle" to establish distances to far-off galaxies. Another spectrograph was of a far-off object called a quasar. From this object, he was able to measure the red-shift and from the Hubble constant, calculate a distance of 3.26 billion light years.



Screwdriver and CDROM spectograph of Sun

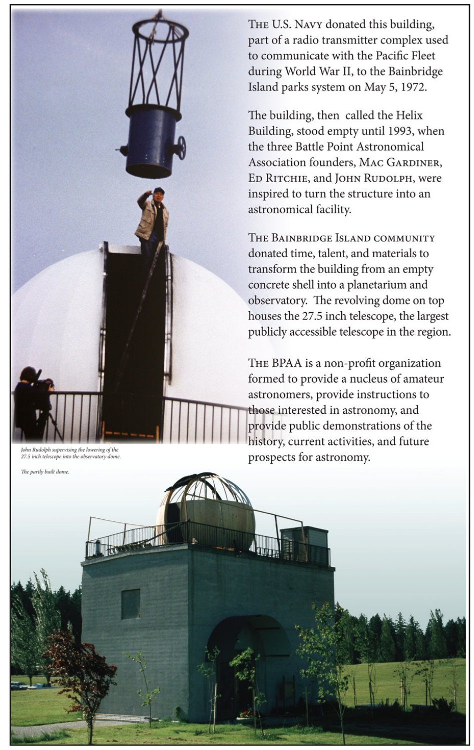
Ken Hose uses his setup to detect eclipsing exoplanets—planets outside of our solar system. By observing stars over multiple nights and looking for small variation in the star's brightness, he can see these planets pass in front of the stars. By carefully observing the nature of the light curves he produces, he can infer planet size and period.

Tim Crawford studies the luminosity of variable stars in a process called differential photometry. He makes his observations in conjunction with the American Association of Variable Star Observers (AASVO). Variable stars change brightness for many reasons and studying the light from these stars gives insight into the nature of the star.

Joe Garlitz presented his work on studying the occultation of asteroids. As asteroids pass in front of background stars they eclipse or occult the star. By getting precise timing of these occultations, we can get higher precision in defining the orbits of the asteroids. He also studies the changes in brightness of the asteroids as they tumble through space. By analyzing these light curves, we can get some idea of the shape and nature of these very local space rocks.

There are "citizen scientists" studying many aspects of the universe. Some are searching for supernova. Some are searching for comets. Is there something that piques your interest?

Slides from this conference are available online at: *http://www.myastronomyjournal.com/journal.php?id=OMSI&jd=2012-05-05.—Stephen Ruhl*



New Plaque

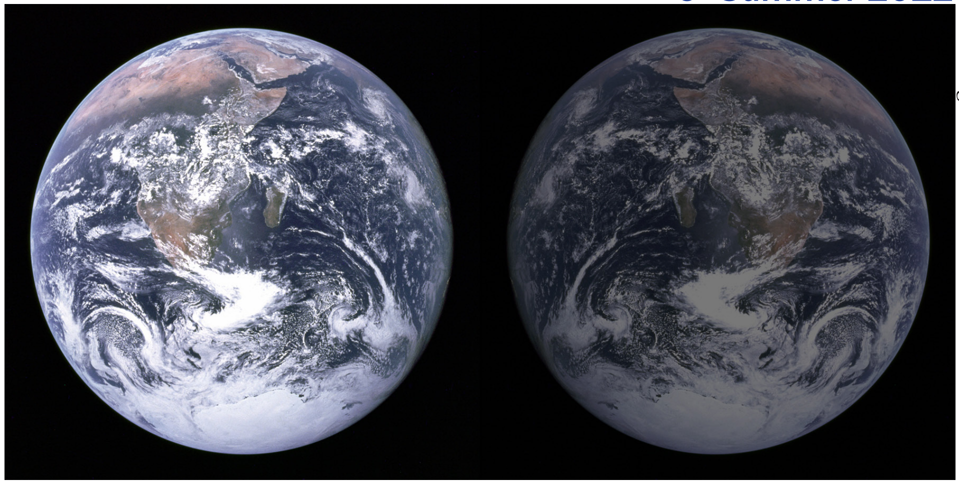
Island artist and club member Dave Berfield and BPAA board members Vicki Saunders and Russ Heglund worked to create the historical plaque above, glazed enamel images on metal, mounted (by board member Nels Johansen) at the left of the Observatory entrance. Thanks to all!

Grand Old 4th

Join us at the BPAA booth during the 4th of July celebration in Winslow. We'll have solar telescopes on hand for sidewalk astronomy, as well as a wealth of knowledge. Anyone with an interest in astronomy should pay the booth a visit. We are also considering marching in the parade this year. Anyone interested in volunteering for the booth or parade should call Steve at 206.855.7883 or email *president@bpastro.org*. It's an excellent chance for new members to rub elbows with BPAA board members and share our enthusiasm for astronomy.

Another Earth?

Astronomy 0.001



Earth image: NASA

Why are we looking for another Earth out in space? And what does "another Earth" mean?

From what we know, the Earth seems to be the only object circling our Sun that can support sentient life as we understand it. The Moon is near, but airless, and without liquid water. Mars is more promising, but we have found no liquid surface water, and when it comes to air, Mars's atmosphere needs more nitrogen and oxygen before we could breathe freely, without artificial aids. Could we manufacture enough of it there?

Nor have we yet found the regolith (the loose surface of dust and broken rock) on the Moon and Mars to have fertile, organic materials. Have we looked in the right places? And would we recognize life that didn't need food or water or air, or needed different combinations of them than we do?

Life as we understand it means reproduction, growth, and death. It means some kind of response to stimuli and a limited self-sustaining ability. Another Earth, our planet's twin, could cradle such life, if it had about the same proportions of water, land and air, composed of the same proportions of molecules, in the same state that exist here.

This twin would need sufficient mass to give it the gravity that attracts and keeps its total composition anchored to its center. The center must be molten magma to create the magnetism that protects life from cosmic rays, that enabled us to develop world-wide communications,, and that we've used in navigation for centuries. It must rotate and revolve at the right distance from a source of light and heat (probably a main sequence star about the same age as our Sun).

Its age should probably approximate our Earth's so that some forms of life, both on the land and in the sea, could have developed. A large moon like ours would help stabilize the planet's tilt, and therefore, its climate, and create tides that could be conducive to the evolution of life.

Perhaps it would need the tectonic activities of Earth that renew the composition of our mantle. And perhaps also the presence of a planet that resembles Jupiter in size and distance, that would sweep up comets and asteroids before they could slam into it.

Scientists would have to understand the requirements of space voyagers, and work out how to provide them. But why should humans want to travel and live in space? Why should they?

Humans have always explored their surroundings, for curiosity's sake, as well as for gain, escape, and defense. Why would we want to find other sentient beings? To exchange ideas? To make discoveries that will improve our lives and status? To destroy them before they destroy us? Perhaps we explore space with the intent to mine it for resources.

Or perhaps we fear a future in which we have so polluted or ravaged our Earth that life here will be imposible. Or perhaps discussions of space exploration are only a ploy of governments, a diversion from economic and political turmoil.

What is it that we really want from space ?

So far space exploration has given us the aesthetic realization of the beauty and the uniqueness of our small blue island in the vast "emptiness" of space. Those first photos taken from spacecrafts caught a wonder beyond words. With this awareness there's been a major leap in our interest in astronomy and cosmology, in quantum physics and alternative universes.

Our explorations have given us access to scientific knowledge that we never could have gotten from Earth-bound instruments. We see, photograph, and study objects from space with a clarity that our atmosphere obscures. We know more about our weather patterns and make better forecasts, have discovered the magnetosphere that shields the planet, and have enhanced military and disaster reconnaissance. We have learned more about the compositions of the surfaces of the Moon and Mars, and comets and asteroids. Other improvements include water filtration system technologies, ultra-small electronic circuits, plastic-like metals, aviation safety systems, and laser eye surgery.

So, assuming that we are committed to finding and colonizing this twin, is it Mars that we have settled on? It's not perfect, but it's close enough to be tempting, and maybe it does have water. What would we need to get there?

In practical terms, the time currently to travel to Mars is between 7 ½ and

9 months. If we could use nuclear power we could cut that down to about 4 months for the one-way trip, if we left when Mars comes closest to Earth—about every 26 months. This conjunction also affects return: If you were to go and come back immediately, Earth would not be where it was on take-off. (Anyway, if you've gone that far you probably would want to stay a bit to recover from the trip and take in some of the scenery.)

You'd want to carry enough food, water, clothes, medical supplies, scientific instruments, and fuel for the trip there, the stay, and the trip back, plus equipment to protect against radiation. That's about three million pounds for a crew of six. But notice: so far the shuttles to the space station have carried only 50,000 pounds, so you'd need 60 rockets taking off and arriving. The best we've managed is one rocket every several years. Does that mean 120 years of putting supplies on Mars to have available when we get there?

You would need to plan for physical problems: in the weightlessness of space your muscles and your bones atrophy from lack of use, so if and when you return to Earth you would be quite weak.

There are also problems of personal relationships. Even the best of friends have found in the months of being in the confined area of a shuttle that the special qualities that attracted them in the first place rub raw when there is no escape.

The cost of the rocket sent to Mars in 2011 was $2.5 billion; this was an unmanned ship using facilities that had already been set up by NASA. If you wanted to start a non-governmental facility that could launch a rocket with a human cargo, some estimates put the cost at $50 billion a year, plus the time to get the facility working. Plus some extra for a few costly mistakes along the way.

Are we ready to go? Do we want to? Will our great-grandchildren go? One last question: Does our behavior warrant another Earth when we aren't taking care of the one we have?

—*Anna Edmonds*

Galaxy Season: New Astrophotos

In late winter and early spring, the nights are long but clear nights are few and far between. None the less, I did have some success over the past few months. All of the following images are taken from Bainbridge Island.

This time of year, the evening's night sky clears somewhat from the overpowering glow of our own galaxy, the Milky Way, to reveal some of its more distant cousins. Countless galaxies are out there: they cluster in groups. The largest nearby cluster is the Virgo cluster, which spans several constellations. (The Milky Way is considered to be on the fringe of the Virgo supercluster.)

The first photograph is a small portion of this cluster called the **Leo Triplet**. The three dominant galaxies are M65, M66 and NGC 3628. As with virtually any photo of this region, if you look closely, you can find more. When I find an obscure galaxy in a photo, I go to World Wide Telescope (*http://www.worldwidetelescope.org/Home.aspx*) and see if I can identify it. There are several here, down to about 16th magnitude. The distance to this group of galaxies is about 35 million light years.

The Leo Triplet (NGC 3628, top, M66, left, and M65 right) April 13, 2012 Luminosity: 55 min (11x300s) RGB: 30 min (6x300s) AT106LE w/ SBIG8300M

Below is another grouping of galaxies in the extended Virgo cluster. The **M81 Group** includes M81, M82, and NGC 3077. This set of galaxies are gravitationally interacting. The spiral galaxy M81 is the dominant galaxy here. M82 is nearly edge on and is a "star burst" galaxy. The gravitational interaction between M81 and M82 is forming new stars. The red filaments coming from M82 are evidence of this. The distance to M81 group is about 12 million light years.

The M81 Group (M81 top left, M82 bottom left, and NGC 3077 right) February 26, 2012 Luminosity: 45 min (9x300s) RGB: 35 min (7x300s) AT106LE w/ SBIG8300M

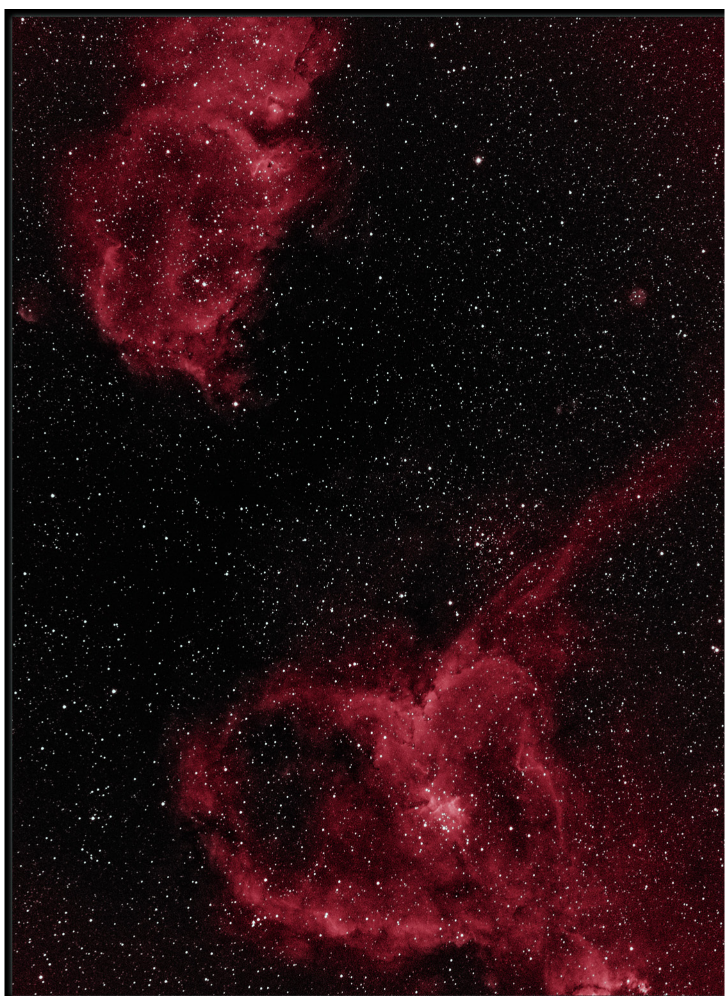
At right is a galaxy that is part of another grouping in Leo. **M95** is shown without its companions M96 and M105. I photographed this galaxy to capture a recently discovered supernova. SN2012av is a type II supernova that was first spotted on March 16, 2012. A type II SN's spectrum is rich in hydrogen, indicating that there was a large amount of the element present when this star blew itself up. M95 is about 33 million light years distant.

M95 with SN2012av March 29, 2012 Luminosity: 45 min (9x300s) RGB: 30 min (6x300s) 1958 Cave 8" f7 Newtonian w/ SBIG8300M

Wide Field Work

To show that you don't need a big telescope, the following images were taken with a Canon 70mm to 200mm zoom lens.

We will segue with a bit of a belated Valentine's Day. T**he Heart and Soul Nebulas** are a couple of star-forming regions in the constellation of Cassiopeia. They are about 7500 light years distant.



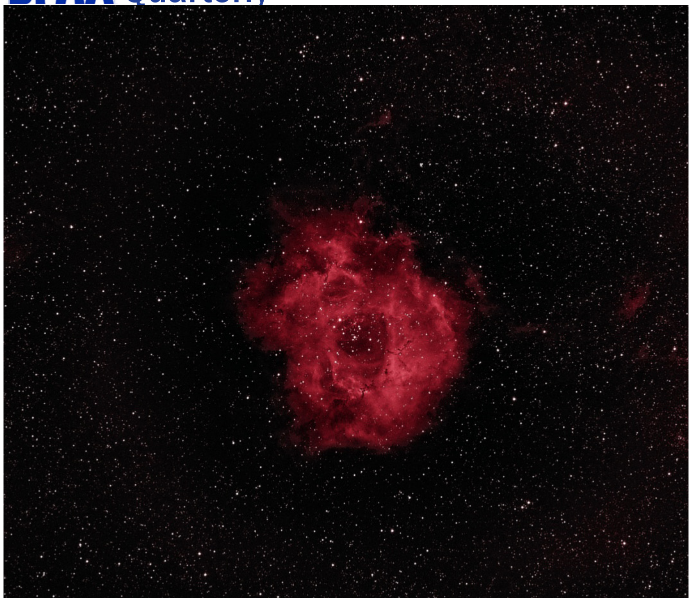
The Heart (IC 1805, bottom) and Soul (IC 1848) Nebulas

February 2, 2012

Canon 70-200mm zoom (at 200)

50 minute (10 x 300s) exposure in H-alpha

SBIG ST8300M



Continuing with the Valentine theme, at left is the **Rosette Nebula**. This is another emission nebula in the constellation of Monoceros. The nebula lies a mere 65 light years away.

The Rosette Nebula (NGC 2247)
February 5, 2012
Canon 70-200mm zoom (at 200)
45 minute (9 x 300s) exposure in H-alpha
SBIG ST8300M

Orion's Sword

The constellation of Orion has many nebulas and other objects of interest. With several star forming regions, it is a dynamic area of the sky. From the top down, the wide field shot below shows the **Flame Nebula** (NGC 2024), the **Horesehead Nebula** (IC434), M42, and **M43**. The bright star at the top is the east-most star of Orion's belt, **Alnitak**.

Orion's Sword (M42, M43, NGC 2024, (IC 434 and a few more things)
February 2, 2012
Canon 70-200mm zoom (at 200)
Red (H-alpha) 75 min (15 x 300s)
GB 30 min (6x300s)
SBIG ST8300M

The **California Nebula**, at right, is my last object. It also is an extended emission nebula in the constellation of Perseus. It is about 1000 light years away and is about 2.5° across.

—Stephen Ruhl

The California Nebula (NGC 1499)
February 3, 2012
Canon 70-200mm zoom (at 200)
80 minute (8 x 600s) exposure in H-alpha
SBIG ST8300M

In this Issue

In Short

Articles

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