Star Gazer News

Astronomy News for Bluewater Stargazers
Vol 9 No.1 Jan 2015

Jan 2015 Contents

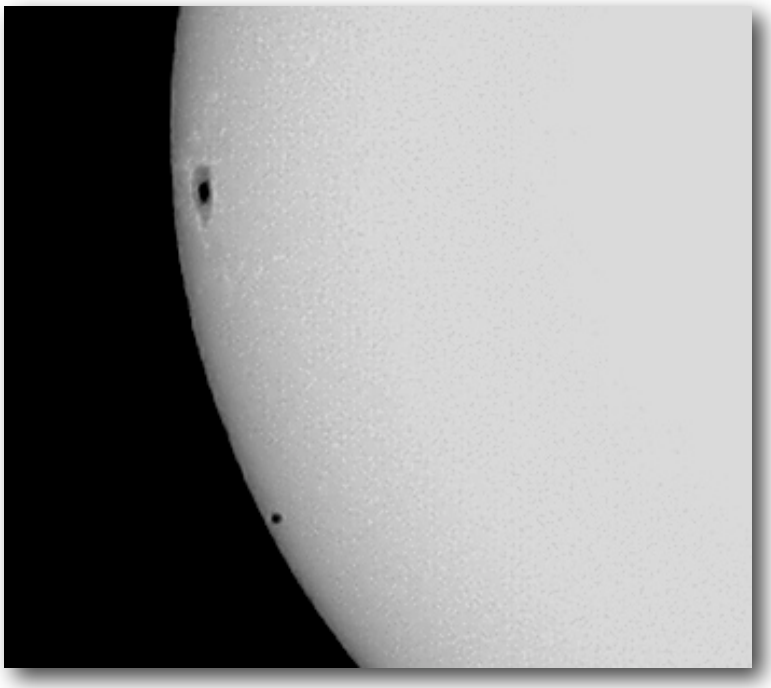
Hunting the Elusive(?) Mercury

Mercury is often called an elusive astronomical target. But there are many BAS members who have seen it and even a few of my neighbours have had Mercury pointed out to them. (Heck, sometimes, even complete strangers, get coerced into looking...) Mercury's elusive reputation may be undeserved because it can be seen easily if you know when to look.

Mercury needs to be as far away from the sun as it can get and as high as possible above the horizon. This usually happens at Greatest Eastern and Greatest Western Elongation. The GEE occurs in the western sky after sunset and GEW in the morning sky before sunrise. See the table on pg. 3 for the list of 2015 GEE's and GEW's. The first one, an evening event, occurs in Jan 2015 and puts Mercury in the western sky with Venus and a few other prominent planets that month. See Evening Planets on the bottom of pg. 13 for more about those.

One of our BAS members and regular contributor of images, Robert A. prompted me to do an article on spotting the 'elusive' Mercury. See pg. 3 which also has pictures of successful Mercury sightings (one his and one mine). Robert's email also prompted me to dig out an image I took a few years ago when Mercury crossed the face of the Sun. **Transits of Mercury** are unique but not that rare (see pg. 3 again). Although I tried several times in the past to see a Mercury transit, the only success occurred Nov 8, 2006, -a cloudy day all over Ontario except for a small break that appeared over Port Stanley. Doug and Paula C. and I made the trek there, saw the ingress of the planet and got a nice long view before the clouds finally covered Port Stanley as well. It was interesting to compare the transit of Mercury to that of Venus in 2004. See the image left. It was one more check mark on my astronomy life list!

The fleet-footed Messenger of the Gods in Greek mythology was Mercury -a familiar figure with wings on his helmet and sandals. Mercury, in Roman mythology, or Hermes, the Greek equivalent, carried a winged staff with two intertwined serpents. The staff, the caduceus, represents commerce, trade or occupations and is sometimes wrongly used to represent medicine. (That one should be the Rod of Asclepius which has only one serpent). See more about the planet below and on pg.3 of this issue.



***Mercury Transit Nov 8, 2006** just minutes (2:16 pm EST) after the silhouette of Mercury appeared against the solar disc. There was a nice large sunspot on the same limb for comparison to the sharp-edged outline of Mercury below it. On June 8, 2004, Venus was 58 arc seconds across, 6 times larger than tiny Mercury's 10 arc second diameter in the image above!*

The next Mercury transit occurs on May 9, 2016. Venus goes across the Sun 112 years from now in 2117. Give your great-grandchildren a heads up. They won't want to miss it.

Canon 20D mounted on TV NP101 4-inch refractor at prime focus, fl = 900 mm (equivalent), exp=1/125, ISO 100. This is a B&W image enlarged and enhanced for contrast with Photoshop. JH photo.

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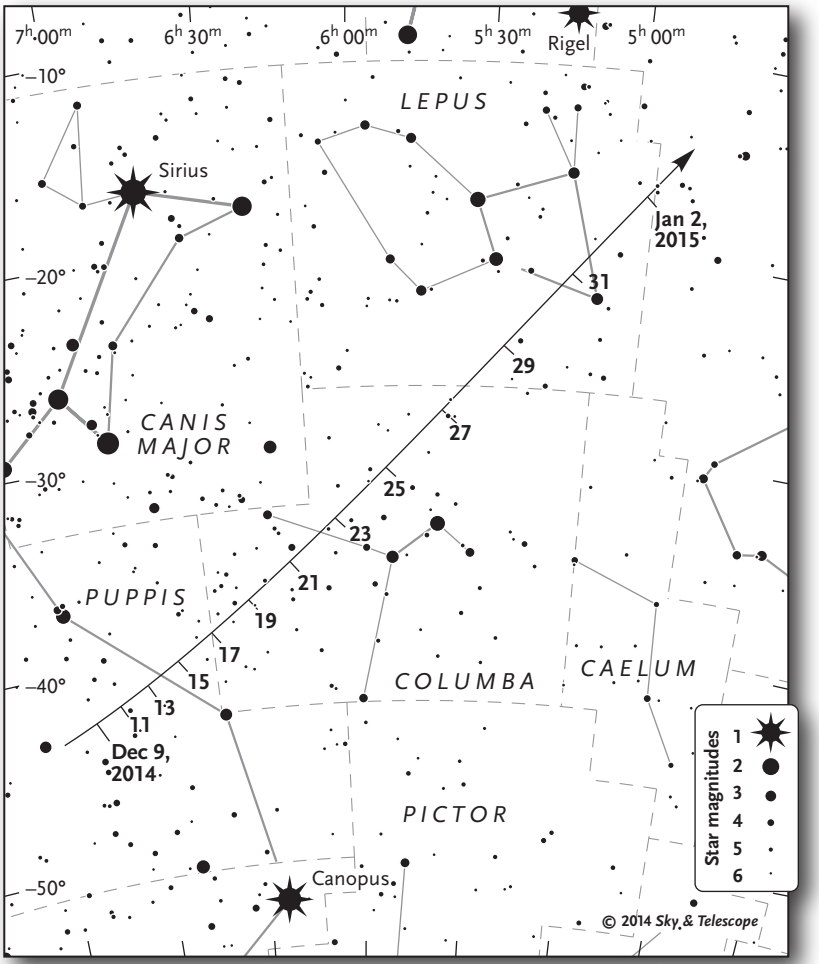
Comet Alert: Look for Lovejoy crossing the lower corner of Lepus Dec 28 to Jan 2, near M79 on Dec 29!



Santa has brought a nice present for stargazers to make the season jolly -a naked eye comet! As long as we get a clear night or two, the viewing should be interesting to say the least.

Comet Lovejoy (C/2014 Q2) brightened enough in mid-December to reach naked eye visibility. It is now visible in the N. hemisphere low above the southern horizon. Use Sirius as your guide!

No reports have come in from BAS members so far, but that is not surprising given the cloudy weather in December. The January finder chart is on pg 5 below and on the BAS website as well.

Astronomical Events in Jan

BAS meetings are not held in January and February but impromptu observing continues at the Fox Observatory on an individual or small group basis. To be put on the notification list email Brett T. at <bretttatton@gmail.com>. More details about the following events can be found on pg 13 or on the BAS website: www.bluewaterastronomy.info:

Jan 03 Sat **Quadrantid Meteors** 120/h peak 9 am, Moon is FM

Jan 10 Sat **Mercury-Venus:** 38 minutes apart in SW sky. Look west after sunset

Jan 14 Wed **Mercury at Greatest Elong: 18.9°E** farthest from Sun at sunset and easiest to observe. Look for Venus about 1° away. See more Mercury observing on pg. 3.

Jan 15 Thu **New Horizons** spacecraft starts Pluto imaging in earnest today.

Jan 20 Tue **New Moon**

Jan 21 Wed **Moon, Mercury, Venus triangle in West.** The three objects form a triangle with 6° sides. Nice! **Note**: Mars and Neptune are also nearby. Mars 15° east of Venus, and a bit closer at 12° is Neptune.

Jan 23 Fri **Double and Triple Shadow Transits on Jupiter** Double starts 23:34 EST Jan 23, triple from 01:27 to 01:52 Jan 24 morning. **Spectacular**! BAS viewing @Fox for sure Fri night/Sat morning if weather permits.

Comet Alert #2: Comet Outburst

Comet 15P/Finlay has unexpectedly brightened from 11.6 to magnitude 8.7 putting it just barely within reach of binoculars! In late December it tracks across Capricornus just below Mars and on Dec 24, slips past the Red Planet at a separation of only 7.5 minutes of arc! There is no telling whether the increase in brightness is temporary so have a look if you can, especially now that the Moon is still a thin crescent (Dec 21 to 26 or so). Finder charts are on the BAS website.

Chasing the Apparition of Mercury

It is only fitting that Greek astronomers named the fastest moving planet after their fastest moving god. The planet is most elusive and spends only a few weeks at its farthest point from the Sun in our sky. These are referred to as the greatest eastern elongation in the evening sky and the greatest western elongation which is seen in the dawn sky. These terms are applied to the other interior planet Venus as well.

Because Mercury takes only 116 days to return to the same place relative to the sun (its synodic period), there are about three of each elongation each year where Mercury gets far enough from the Sun to become easier to see. Because the angle of the ecliptic varies over the year, sometimes Mercury stays rather nearer the horizon than at other times. So the good elongations are reduced to 2 or 3 per year. Still, it stays low on the horizon always in the turbulent atmosphere and one has to make a serious attempt to observe it when it is at its best.

The best times to shoot for Mercury in 2015 are around the first two weeks of May for evening viewing and the middle two weeks of Oct for a morning apparition. In particular look west after sunset from May 1 to May 13, 2015 and in the morning sky before sunrise from Oct 10 to Oct 22. The list for Mercury's elongations in 2015 follows:

Evening GEE:		Morning GEW:	
Date	**mag.**	**Date**	**mag**
Jan 14	-0.7	Feb 24	0.4
May 7	**0.2**	Jun 24	0.4
Sep 4	0.1	**Oct 16**	**-0.6**
Dec 29	-0.6	**[best events in bold]**	

Transits of Mercury

Transits of Mercury are more common than transits of Venus. We can wait a century or more for a Venus transit, but the speedy planet Mercury passes between the Sun and Earth (inferior conjunction) at least 3 times a year (Venus does so only once and most of the time misses the Sun). No one who saw either of the Venus transits in 2004 and 2012 will be alive for those in 2117 and 2125. But there will be an even **dozen** opportunities to view Mercury crossing the Sun in the 21st century alone.

Mark your calendar for May 9, 2016! Get out your solar filters or H-alpha telescopes and watch the tiny black silhouette of the innermost planet 'streak' across the sun from 11:12 UT (7:12 am DST) to 18:42 UT (2:42 pm EST). Hopefully it will be clear for some portion of those 7.5 hours! If you miss it, there are only 3½ more years to wait for the next Mercury transit: on Nov 11, 2019, i.e. Remembrance Day! Try not to forget that.

Hi John,

I know you're always looking for SGN content.

May I suggest an article on Mercury.
Fast little devil. Circles the sun in about 88 days and never wanders very far from its glare.

It will be ending its Apparition cycle very soon. [Nov 1, 2014 was GEW -ed]

At the prompting of a BAS member named Lorraine, I braved -3°C temperatures just west of Woodstock in the middle of nowhere to get it at the peak of its orbit on the morning of November 1st.

That's the cement plant in the foreground. It looks really cool lit up at night and I always admire it on my way to work when on the midnight shift. So of course I wanted to get it composed in an astronomical themed shot. Perfect! Note Spica faintly at the 5o'clock position in relation to Mercury.

Feel free to use attached image if you are inclined to compose an article. If you do please cite Lorraine as my inspiration. Without it the shot would never have been taken! Do you know how hard it is to get out of a warm bed at 5am, without breakfast, and then driving 40 km to take three shots in below 0°C weather?
It wasn't too hard, just one word, FUN!

Thanks. [Thanks Robert, for the]
Robert [idea for the article. -ed]

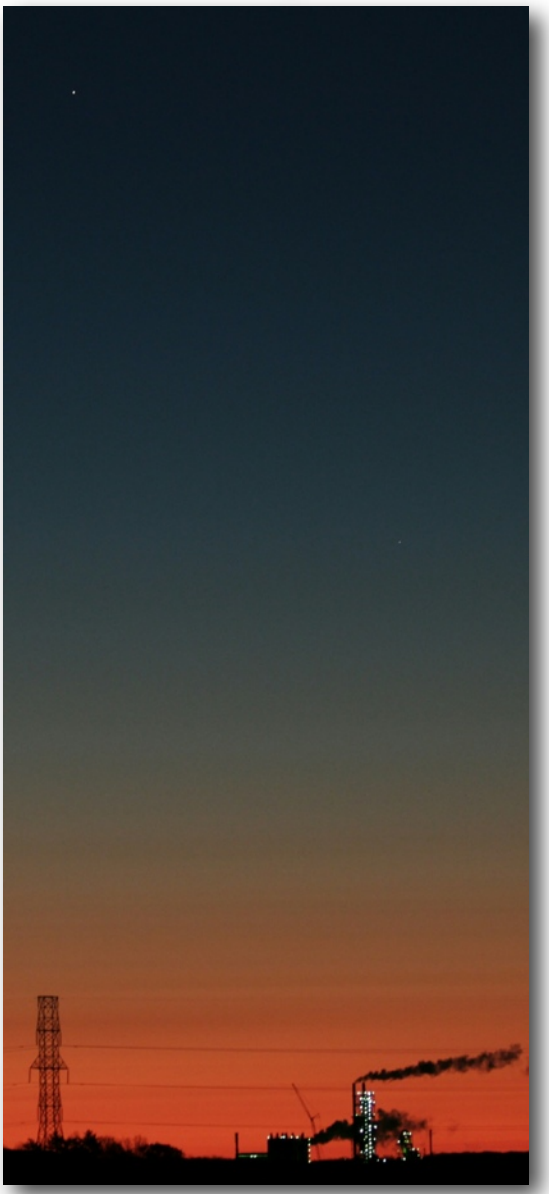
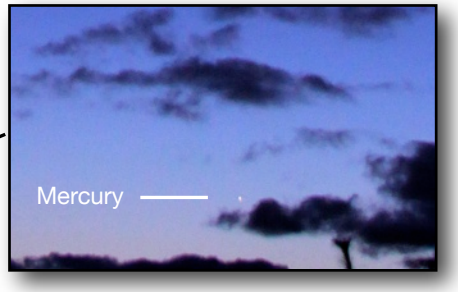


Image by Robert Atkinson *Nov 1 @ 6:28am. Canon 70mm f/4 (his favourite lens) ISO 400 at 1/10 of a second. Cropped, contrast enhanced. (Mercury is at upper left).*

Image left *by John H. Feb 25, 2012 @ 6:57 pm. In late Feb 2013, it was not necessary to set the alarm for an early wakeup to catch Mercury at Greatest Eastern Elongation. It was visible just after sunset. There was a nice grouping of other planets there as well. Venus was below the crescent Moon, Jupiter above and left. Inset view below shows Mercury more easily. The shot was taken only 24 minutes before Mercury set but it was about 2 weeks before GEE (Mar 6) so this planet is not impossible to see if you plan your observations carefully. Canon 50D 24mm f/4, ISO1250, ½s exp.*



Eclipses:

Only one eclipse, a **total lunar eclipse on Sep 27** will be a good viewing event for N. America. The only good solar eclipse is not visible from here but tracks across the North Atlantic south of Iceland with the only landfall being the Faroe Islands.

Here is the list of eclipses for 2015:

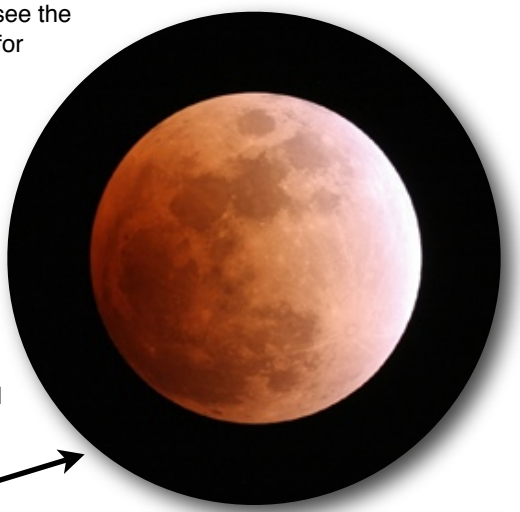
Mar 20: 2015 Total Solar Eclipse. Only visible in daylight skies south of Iceland. N.America is in darkness at the time.

Apr 4: Total Lunar Eclipse starts 6:15 DST, Moon sets before start of totality locally at 7:02 am DST. West coast of Canada is the place to be to see it all.

Sep 13: Partial Solar Eclipse Only visible from Antarctica and S. Africa, S. Pacific Ocean.

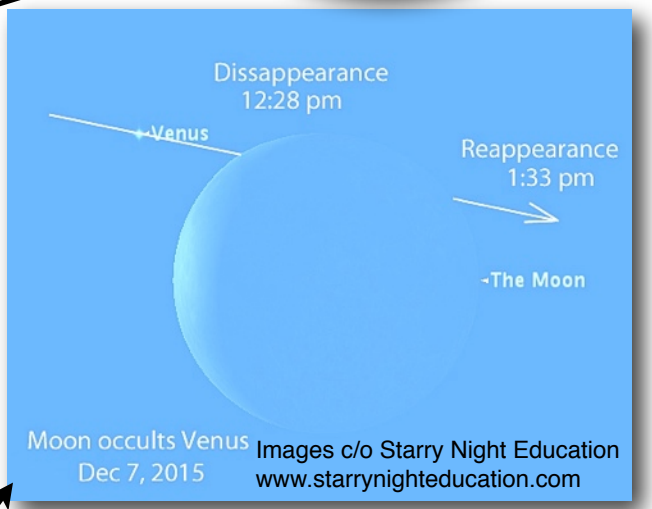
Sep 27: Total Lunar Eclipse Best of the year with totality starting at 10:11 pm DST Sep 27 and continuing to 11:23 pm. Moon is 35° high at mid-eclipse and climbing. **A prime-time (Sunday night) astronomical event!**

Sep 27, 2015 will see the best lunar eclipse for 2015. Image right was taken on Feb 20, 2008. Canon 20D at prime focus of C-8 effective focal length 3200 mm, f/16, ISO 100, exp = 4 s. Image taken at 10:02 pm just before start of total phase.
JH photo



Planetary Occultations:

Next to an eclipse, the passage of a planet behind the Moon is a fun event to watch. Ideally the brightest planet (Venus) would pass behind the second brightest object in the sky, the Moon, an event that, if the path were central, would take about an hour. With seven planets in the list of candidates you would think occultations would be more common than they are. The Moon is, however a fairly small object (you could get ten moons in the space between the pointer stars Dubhe and Merak in UMa) so occultations are as rare as eclipses. Also, like eclipses, you have to be in the right place at the right time as the ground track is narrow.
In 2015, only Venus and Uranus are occulted by the Moon, Venus on Dec 7, while Uranus is occulted an amazing 12 times! Sadly, none of the Uranus events are visible from our area and the Venus event is in daylight. (Diagram right). Bummer. But, both the Moon and Venus should be visible even in the daylight.
Here are times for the **Venus occultation by the Crescent Moon:** (Diagram from Starry Night centre right)



Images c/o Starry Night Education
www.starrynighteducation.com

It is a daylight event, but these two should be easy in binoculars and even naked eye. Locate first in binos then try without optical aid. GOTO scopes should have no problem. The Moon will be 21° over the SW horizon.

Dec 7: Disappearance on bright limb: 12:28 pm EST, for 65 min and Reappearance at 1:32 pm EST. Moon is 3 days before New.

Occultations of Bright Stars:

The Moon can also pass in front of bright stars and can occult faint ones almost any night that it is up. Star occultations are instantaneous when the Moon's limb, undimmed by atmosphere, cuts out the light from the star abruptly. During totality of the lunar eclipse Sep 27 some faint stars will be occulted but the Moon is not in a rich star field. As for first magnitude stars, only Aldebaran is occulted by the Moon this year. Four Aldebaran occultations occur but only two in dark sky for E. Canada.

Aldebaran occultations by the Moon:

Jun 15: Occultation in morning twilight, disappearance 6:08 am, reappearance 6:20 am EDT. Graze near Durham?
Sep 5: Disappearance bright limb 12:07 am EDT reappearance dark limb 12:39 am. Occurs in dark sky; Moon 2° up climbs to 7°.
Oct 2: Disappearance bright limb 9:53 am EDT Reappearance at 10:53 am- a daytime event. Moon LQ.
Nov 26: Disapp. 5:38 am EST, Reapp. at 6:28 am EST. Moon is Full, elevation from 16° to 13°. Sun rises 7:34 am that morning. The second dark sky event but the moon is full this time.

Meteor Showers:

There are 4 meteor showers in 2015 which should produce 60 or more shooting stars per hour. They are the Quadrantids (120/h) on Jan 3, the η-Aquariids (60/h) on May 6, the Perseids (90/h) on Aug 13 and the Geminids (120/h) on Dec 14. The first two occur near FM and the last two occur during NM or crescents. Here is the list of the top four shooting star displays for 2015:

Jan 3: Quadrantids. Actually peaks at **9 pm EST Saturday Jan 3** with **120/h** but the **Moon is full** and will brighten the skies the entire time.

May 6: η-Aquariids peak is 9 am DST Wednesday with a possible 60/h, but this is daylight so observe the night before or the night after. The **Moon is also near full** and will brighten the skies the entire time.

Aug 13: Perseids peak 2 am DST Thursday Aug 13 only a day before the **New Moon.** This is the start of Starfest (Aug 13-Aug 16 in 2015). **The BEST meteor shower for 2015.**

Dec 14: Geminids peak at **120/h** during daylight (1 pm) but Dec 13 and 15 have only thin crescent Moons brightening the evening sky. Both nights should be good for meteor watching. It may be winter, but make the effort to observe this one.

Planetary Groupings:

Collections of planets (and the Moon) in the sky can be the most pleasing events in astronomy especially as they tend to occur at sunrise or sunset and the background sky can be quite colourful. This year there are several notable groupings which can be highlighted.

Evening sky conjunctions:

Jan 11: Mercury and Venus. Less than 1° apart.

Jan 21/22: Mercury, Venus and Crescent Moon. Mars sits above the group as well. See pg. 13. below.

Feb 20: Venus, Mars and Crescent Moon. All three fit in a 2° circle. Uranus sits 15° above the group.

Jun 30: Venus and Jupiter conjunction. Less than a half a degree apart.

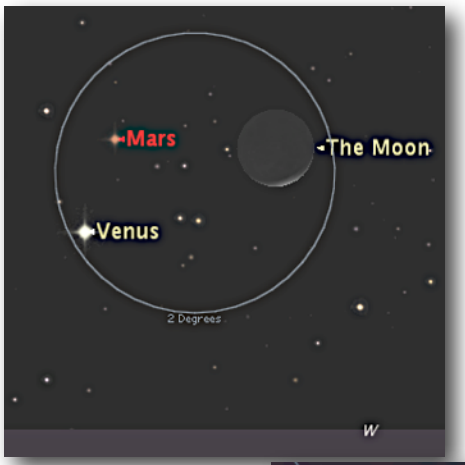
Jul 18: Venus less than 1° from Crescent Moon. Jupiter about 6° away.

Morning sky conjunctions:

Oct 8: Venus only 0.7° from Last Crescent Moon Mars and Jupiter just below.

Oct 9: Last Crescent Moon, Mars, Jupiter in 5° triangle. Nice!

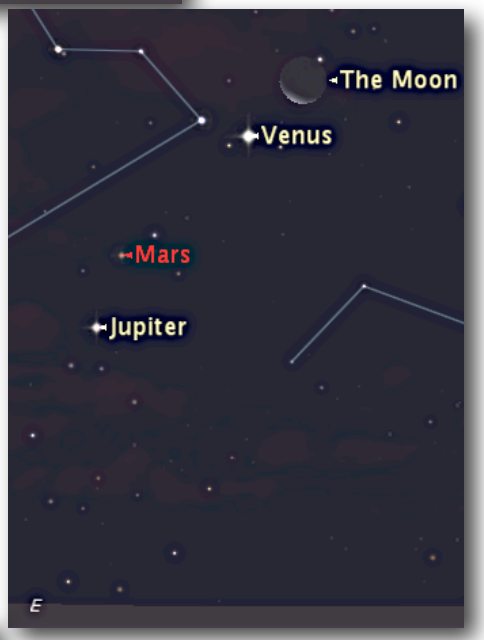
Oct 26: Venus, Jupiter and Mars within 7.5° of each other for 3 weeks centered on this date. Oct 17 Mars-Jupiter separation is 0.4°, tightest group of three is on Oct 26. On Oct 25, Venus-Jupiter separation just over 1°, on Nov 3 Venus-Mars separation is 0.7°.



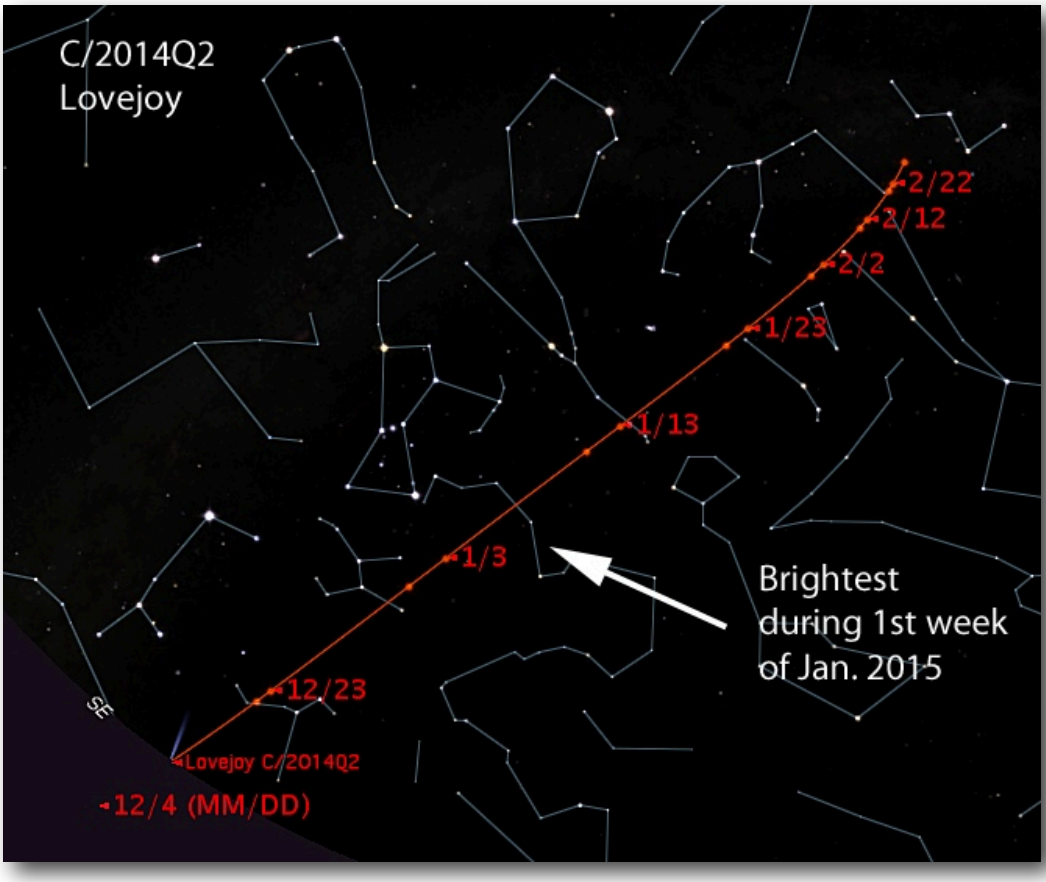
Feb 20, 2015: 9 pm
Nice grouping of planets and Moon above western horizon.

Images on this page c/o Starry Night Education www.starrynighteducation.com

Oct 8, 2015: 6 am
Three planets and the Moon line up along the ecliptic in the morning sky. Except for the daytime occultation Dec 7, this is the closest Venus gets to the Moon this year.



Both Venus and Mars close in on Jupiter later in October. On Oct 17, Mars and Jupiter are only 0.4° apart and on Oct 26, Venus and Mars are about a degree apart! Good viewing in a low power telescope eyepiece.



C. Lovejoy in Jan 2015

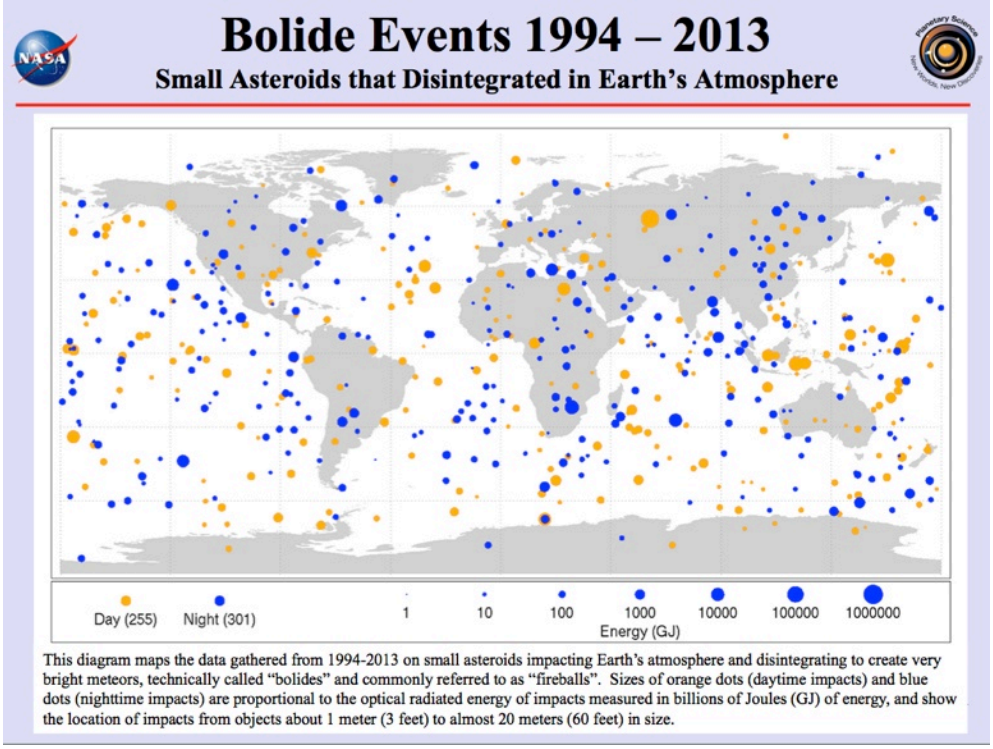
Comet Lovejoy, C/2014Q2, brightened in late December 2014 and is now fairly well-placed above the S. horizon below Orion. It is definitely worth getting out to see if the clouds let up. Starry Night indicates a maximum of 5.3 in the first week of January as it sweeps through Lepus, Eridanus and into Taurus. Seiichi Yosida shows it reaching 6th magnitude so if it is not naked eye, then it will be a very good binocular comet in early January.

Unfortunately the Moon is full Jan 4 so plan to observe in the last week of December or the 2nd and 3rd week of January to avoid moonlight. Early in Dec, Lovejoy will be rising in the early evening and between Christmas Day and the New Year, Lovejoy is 20° high on the southern meridian at 11 pm. The FQ Moon starts to interfere after then. By Jan 9, the LQ Moon will not be rising until well after dark. Lovejoy is in Taurus by mid-January.

If nothing else shows up in 2015, this may be the comet to observe this year.

New Data Shows Frequency of Small Asteroid Impacts

Linda Billings & NASA/JPL Near-Earth Object Program Office
November 14, 2014



This diagram maps the data gathered from 1994-2013 on small asteroids impacting Earth's atmosphere and disintegrating to create very bright meteors, technically called "bolides" and commonly referred to as "fireballs". Sizes of orange dots (daytime impacts) and blue dots (nighttime impacts) are proportional to the optical radiated energy of impacts measured in billions of Joules (GJ) of energy, and show the location of impacts from objects about 1 meter (3 feet) to almost 20 meters (60 feet) in size.

Small asteroids near Earth, with sizes of only about a meter, hit the atmosphere and disintegrate with surprising frequency - around every other week, new data show. Data gathered by U.S. government sensors released to NASA reveal that these small impact events are frequent and random. A map of these small impact events - known as fireballs or bolides - recently released by NASA shows the frequency and approximate energy released by bolide events detected from 1994 through 2013. Over this 20-year interval, U.S. Government assets recorded at least 556 bolide events of various energies. On this world map illustration, the size of the orange dots (daytime events) and blue dots (nighttime events) are proportional to the optical radiated energy of the impact event measured in billions of Joules (GJ) of energy. An approximate conversion (provided by Peter Brown and colleagues in 2002) indicates the smallest dot as 1 billion Joules (1 GJ) of optical radiant energy, or about 5 tons of TNT explosives. The larger dots correspond to impact energies of about 300 tons, 18,000 tons and one million tons of TNT explosives respectively.

The largest impact energy recorded during this 20-year interval was the recent daytime Chelyabinsk event (440,000 - 500,000 tons of TNT) recorded over central Russia on February 15, 2013. This small asteroid that exploded in the atmosphere near Chelyabinsk, Russia was about 20 meters in size before it hit the Earth. While that impact focused public attention on the potential hazards of NEO impacts with Earth, space scientists have long known that such events are just a part of Earth's geologic history.

NASA's Near Earth Object (NEO) Observations Program finds, tracks, and characterizes asteroids whose orbits bring them within approximately 50 million kilometers (31 million miles) of Earth's orbit about the sun.

"We now know that Earth's atmosphere does a great job of protecting Earth from small asteroids", said NASA NEO Observations Program Executive Lindley Johnson. The new data will be extrapolated to estimate more precisely the frequency of impacts by asteroids large enough to cause ground damage. "How big is the population of larger asteroids we really need to worry about? We need to better understand that." Johnson said.

The NEO Observations Program already has identified more than 96 percent of the estimated population of nearly one thousand one-kilometer or larger sized asteroids. The Program's current objective is to identify 90 percent or more of the far more numerous NEOs larger than 140-meters in diameter. It is estimated they may be as much as 25 times more numerous than 1 kilometer asteroids.

"These newly released data will help NEO scientists construct a more complete picture of the frequency and scope of asteroid impacts with Earth," said Johnson.

The NEO Observations Program is a lead participant in a newly organized International Asteroid Warning Network.
For more information:
http://science.nasa.gov/planetary-science/near-earth-objects/
http://www.nasa.gov/mission_pages/asteroids/overview/fastfacts.html
For a detailed list of bolide events: http://neo.jpl.nasa.gov/fireball

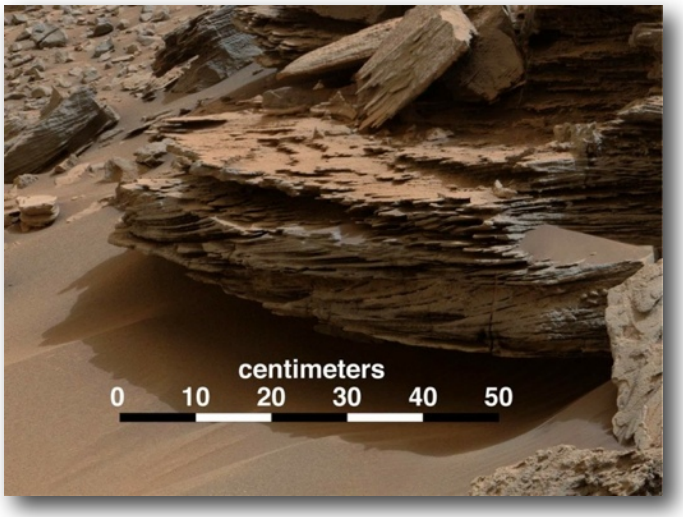
The Asteroid Hazard:

Every day, Earth is bombarded with more than 100 tons of dust and sand-sized particles from space. About once a year, an automobile-sized asteroid hits Earth's atmosphere, creating a spectacular fireball (bolide) event as the friction of the Earth's atmosphere causes them to disintegrate - sometimes explosively.
Studies of Earth's history indicate that about once every 5,000 years or so on average an object the size of a football field hits Earth and causes significant damage. Once every few million years on average an object large enough to cause regional or global disaster impacts Earth. Impact craters on Earth, the Moon and other planetary bodies are evidence of these occurrences.
Meteor Crater near Winslow, Arizona, is evidence of the impact with Earth's surface of a 50-meter asteroid about 50,000 years ago. Impact of the metal-rich object released energy equivalent to a 10 megaton explosion and formed a 1.2 kilometer-diameter crater. Scientists have identified several dozen impact craters in North America alone, most masked by erosion and vegetation.
Scientific assessments of the risk of, as well as the hazards posed by, future asteroid impacts with Earth vary. In a 2013 paper published in Nature, Peter Brown and his colleagues reported that "telescopic surveys have only discovered about 500 near-Earth asteroids that are 10-20 meters in diameter (comparable to the Chelyabinsk asteroid) of an estimated near-Earth asteroid population of around 2 x 10^7 [20 million], implying that a significant impactor population at these sizes could be present but not yet cataloged in the discovered near-Earth asteroid population."

Namibian Message for Martian Exploration

"*Last night I dreamt I was back in the Namib,*
the desert all around, dunes rising and falling like ocean swells,
shooting stars above me.
That silence only broken by echoes in the wind'"
Arab-American Poet Naomi Shihab Nye

It has been been a great month for Mars enthusiasts with the release of fascinating images and measurements from the Mars Curiosity rover, currently exploring the base of Mount Sharp, in Gale Crater. Gale is an old Martian crater, having formed between 3.5 and 3.8 billion years ago. It is 154 km in diameter and has a 5.5 km central peak composed of sedimentary debris, called Mount Sharp, a.k.a Aeolian Mons. Curiosity has returned striking images of "cross-bedded sandstone" at the base of the mountain. It now appears that this central peak was formed by sand and gravel layers deposited during repeated flooding episodes within Gale Crater during early Martian history. The phenomenon is called "cross-bedding" because it occurs when sedimentary rock layers are deposited at angles to each other. It is hard to overstate the importance of this discovery because it strongly suggests that Gale crater was repeatedly flooded from an inflow channel located at the crater rim. Geomorphologists can work out the general direction of the water flow from the cross-bedding angles of the sandstone layers. When I saw the first published photos of the cross-bedded layers I was immediately struck by the similarity of their pattern to fossilized sandstone layers I had photographed in a Sossusvlei sand dune depression in the Namibian desert. The pattern of formation was similar, deposition of sediments by repeated flooding and then the removal of the water by evapouration and seepage. Paula and I were part of a small group of Canadians that explored Namibia and South Africa this past summer, on a trip that we called a "Starfari".



Curiosity Image: Sedimentary rocks at base of Mt Sharp - ***NASA JPL***

Sedimentary Rocks in Deadvlei, Namib Desert ***(Cunningham photo)***

Our Sossusvlei excursion started early, in the morning darkness, and our Namibian driver, Elvis, was waiting to transport us the 65 km distance to watch the sunrise over the famous sand dunes. These Sossusvlei sand dunes are classified as "star dunes" because they look like stars from above and form when the winds, blowing from different directions, overlay the dunes. Indeed, they are among the highest dune fields in the world. The highest Namibian sand dune of them all, composed of 5 million year old sand, is called "Big Daddy" (Dune #7), and reaches 1,066 ft in height. One couldn't help but think that some of the views of the Martian deserts and dunes might share similarities to those we saw in the Sossusvlei. In my imagination that morning, as I looked over the waves of desert sand dunes, I could easily have been transported to the deserts of Mars.

Our climb to the top of the large dune, shown in the preceding photo, was quite challenging because we had to take at least two steps to advance one step. It was fun to sit at the dune crest and then watch a brilliant, reddish-orange sun break the eastern horizon of the dune field. This sunrise process lasted a couple of minutes and was quite striking. We marveled at the various hues of the sand dunes as the sun gained altitude. We then "sand-skied" down the dune to an extensive grey-white flat depression between the dunes called a "clay-calcrete" salt pan. The surrounding orange sand dunes provided a stunning backdrop to the skeletal remains of the camelthorne trees. This fascinating place, known as "Deadvlei", which means"dead marsh", is neither a marsh or completely dead! This was where I photographed the cross-bedded sandstone. To our surprise, at the bottom, we encountered an oryx, the national animal of Namibia, and later, an inquisitive jackal. Both seemed quite at home in this dry environment.

During the latter stages of our Namibian tour we encountered herds of mountain zebras, African bush elephants, hundreds of springboks, leopards, ostrich, and warthogs. We even managed to track and locate the endangered black rhino. In every case we marveled at the adaptations of the animals and their ability to make a living in this dry land. Our guides told us that the Namibian people value their wild animal populations and they have accorded them protection in their constitution.

The plants and animals of Namibia illustrate dramatically the important role that water abundance plays in the ecology. Seeing such a diversity of plant and animal life in the harsh Namibian desert

Above: *Paula and Doug - Sossusvlei sunrise sand dune climb (Gerry Bissett Photo)*

just reinforced the idea in our minds that life is extremely plastic and adaptable. The story of life on Earth for the past 3.6 billion years is one of continual change, adaptation and subsequent evolution. We live on a planet that is wonderfully suited to nourish life and create new species through natural selection. Our Earth sits squarely in the solar system's habitable zone, where water can exist in all three states. As we understand it, water chemistry is essential to the physiology of life. So, the question is posed. Is life in our solar system a phenomenon unique to Earth? Are there other places in our solar system, like Mars (arguably located at the outside edge of the habitable zone), or Jupiter's moon Europa, or Saturn's Enceladus, that now, or in the past, allowed life's biochemistry to start and prosper? The scientific jury is still out for all of them. However, recently published results from the Curiosity rover in Gale Crater on Mars, are very interesting and certainly provocative. Namibia's message for Mars is two fold: firstly, pay attention to the water, and secondly, life is incredibly adaptable!

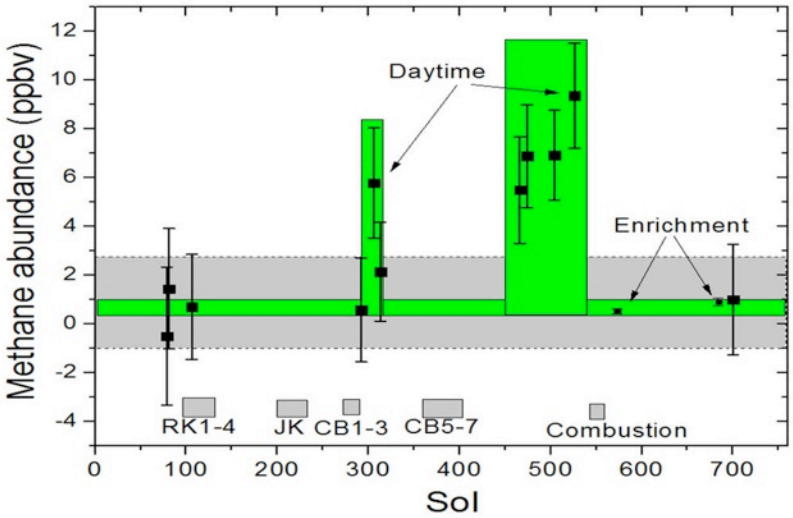
Above*: A jackal passes through Deadvlei during our lunch (Cunningham photo)*

Image right: *"Gemsbok" aka "oryx" at Deadvlei (Cunningham photo)*

On Earth, methane is usually associated with biological activity. Imagine the surprise of Curiosity scientists when, on four occasions, during the past two months, Curiosity measured from Gale crater, a ten-fold spike in the concentration of Martian atmospheric methane. (The normal background level for Martian methane is only 1 part per billion.) It seemed that methane was being injected randomly into the Martian air above Gale Crater and then air currents wafted it over the rover's detectors.

This measurement has generated lots of discussion among biochemists, planetary scientists, and astrobiologists. The common consensus is that if extraterrestrial life exists in our solar system it will most probably be bacterial life of some sort. On Earth, methane mostly originates from anaerobic bacteria (called methanogens) living in low oxygen environments, like the intestines of livestock. What gets scientists so curious is that the Martian methane spike could be the metabolic chemical signature of Martian bacteria located in cracks beneath the crust of Gale Crater. Imagine, Martians as bacteria! (cont'd below graph)

Graphic shows tenfold spiking in methane abundance in the atmosphere around Curiosity rover. ***Credit: NASA/JPL-Caltech****. More at http://www.astrobio.net/news-exclusive/curiosity-detects-methane-organic-molecules-gale-crater/#*



But, there are other ways of producing methane without using methanogen bacteria. These possible sources (subsurface calthrate breakdown, geochemical reactions, and UV degradation of surface organics from meteorites), will have to be investigated. So, the source of the methane spikes will not be known anytime soon. I do hope, in my lifetime, we can solve this Martian methane riddle and in doing so, be one step closer to answering the question of whether the phenomenon of life in our solar system is unique to Earth. Either way, the answer will be profound!

Spectacular image shows planet formation in action

Nov 7/14 Hamish Johnston

The clearest image yet of planets forming around a star has been unveiled by astronomers working on the ALMA array of radio telescopes in Chile. The image shows a series of concentric rings of material surrounding HL Tauri – a very young star that is only about one million years old.

"When we first saw this image, we were astounded at the spectacular level of detail," says Catherine Vlahakis, ALMA deputy program scientist. "HL Tauri is no more than a million years old, yet already its disc appears to be full of forming planets. This one image alone will revolutionize theories of planet formation".

HL Tauri is about 450 light-years away, and is expected to evolve into a "main sequence" star like the Sun. Indeed, the ALMA team believes that HL Tauri provides a glimpse of what our solar system looked like more than four billion years ago, when the Earth and other planets were forming.

Swept-out orbits

Stars form within clouds of gas and dust, and some of this material will end up orbiting the star. Over time, some of this material binds together to form increasingly large pieces of rock and ice, which create a thin disc around the star. Then, material in the disc will join up to create large structures such as asteroids, comets and planets. The HL Tauri system appears to be at the point in its evolution when the nascent planets have acquired enough mass to "sweep out" smaller objects from their orbits, creating the observed structure of rings.

Images with this level of detail have, up to now, been relegated to computer simulations or artist's impressions.

"Most of what we know about planet formation today is based on theory," explains Tim de Zeeuw, director-general of the European Southern Observatory (ESO), which part-funded ALMA. "Images with this level of detail have, up to now, been relegated to computer simulations or artist's impressions."

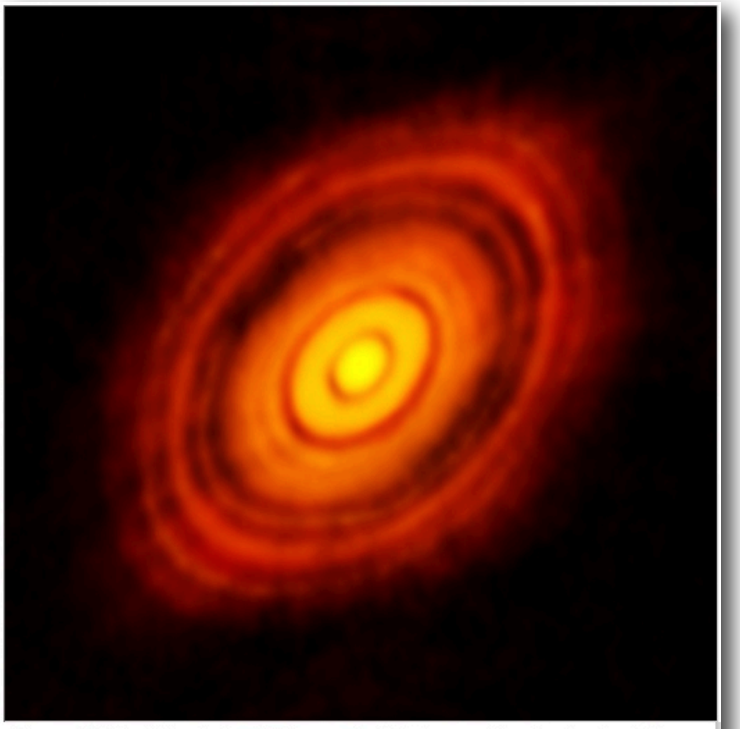


Image of HL Tauri taken by the ALMA array of radio telescopes. The ring structure in the disc of gas and dust surrounding the young star probably means that planets have begun to form. (Courtesy: ALMA/ESO/NAOJ/NRAO)

Spaced-out antennas

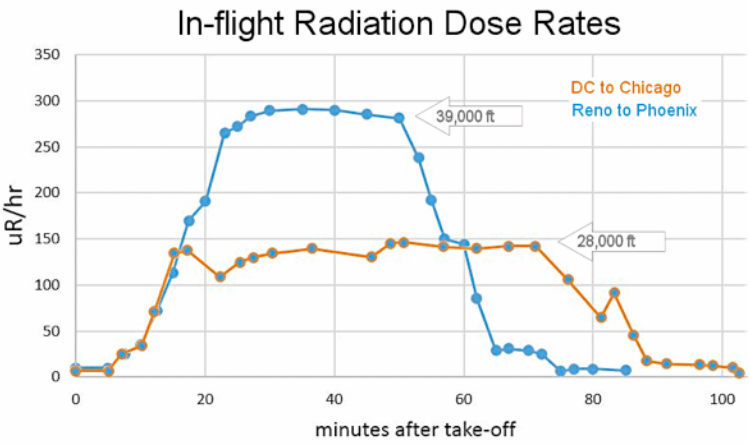
The spatial resolution of the image is about five times the distance between the Earth and the Sun, which is better than could be achieved by the Hubble Space Telescope. This high resolution was achieved by spacing the individual ALMA antennas – located in the Atacama Desert – as much as 15 km apart. When connected together, the array functions as a giant radio telescope with a resolution that is much better than an individual antenna.

Radiation Levels During Plane Travel

Regular readers of Spaceweather.com have been following the travels of Tony Phillips, who spent the past week flying commercial jets back and forth across the USA for meetings in Washington DC. In addition to his usual baggage, he carried a pair of radiation sensors onboard. Sitting in the economy section of a US Airways flight from Reno to Phoenix on Nov. 11th, Phillips recorded dose rates which were almost 30 times higher than background dose rates at ground level. On Nov. 15th, he gathered data from a return leg, American Airlines flight 2407 from Washington DC to Chicago. It was only half as bad:

The radiation inside these planes comes from space--that is, cosmic rays that penetrate Earth's atmosphere and reach down to aviation altitudes. In the plot we can see what a difference altitude makes: Cruising at 39,000 feet, the Reno to Phoenix flight was closer to space and thus experienced double the radiation of the DC to Chicago flight cruising at 28,000 feet.

The radiation sensor Phillips used to make these measurements is the same one that Earth to Sky Calculus routinely flies onboard helium balloons to measure cosmic rays in the stratosphere. It detects X-rays and gamma-rays in the energy range 10 keV to 20 MeV, similar to energies used by medical X-ray machines and airport security scanners.



We can put these doses into context by comparing them to medical X-rays. In a single hour flying between Reno and Phoenix on Nov. 11th, the passengers were exposed to about the same amount of radiation as an X-ray at the dentist's office. Such a dose is not a big deal for an occasional flier, but as NASA points out, frequent fliers of 100,000 miles or more can accumulate doses equal to 20 chest X-rays or about 100 dental X-rays. Lead aprons, anyone?

Some experts reading these reports on Spaceweather.com have pointed out that X-rays and gamma-rays represent only a fraction of the radiation present at aviation altitudes. The true dose could be doubled or tripled by neutrons, a component of cosmic rays known to be especially good at delivering energy to human tissue.

From the Nov 16 issue at www.Spaceweather.com

A lucky, but lonely, planet

From the November 2014 issue of Physics World www.physicsworld.com

Lucky Planet: Why Earth is Exceptional – and What That Means for Life in the Universe
David Waltham 2014 Icon Books/Basic Books £14.99/$26.99hb 224/208pp

It is a common view among astrobiologists that life is not a one-off, and that biospheres, and perhaps even civilizations, are plentiful. Given the growing number of known extrasolar planetary systems and our continuing astonishment at the hardiness of life in extreme environments, this opinion is relatively well-founded. But David Waltham's book Lucky Planet reminds us that there is a second, equally common view: our existence may be the result of incredibly good fortune, and much of what we regard as evidence for life's abundance may actually be the result of our own biases.

For example, while rocky planets appear to be common – the latest estimates suggest there is at least one for every star in the Milky Way – Waltham poses a difficult question when he asks how many of these we can expect to be truly "Earth-like". The word "Earth-like" is widely abused by scientists and journalists alike; in fact, we are still struggling to find a sensible definition of what makes the Earth "Earth-like".

Many books on this subject present a relatively objective view of the Earth, with an implicit assumption that we live on one of a large family of bodies with rocky, water-covered surfaces and pleasant temperatures. Lucky Planet, however, begins with the assumption that the Earth is rare, and as such considers it more specifically, from its geochemistry to its astronomical habitat (with a slight detour via the nature of the visible cosmos). This more focused viewpoint gives the reader a much more nuanced impression of our world, in particular the Earth's climate – an essential factor in assessing habitability. Waltham shows us that the deeply complex relationship between the land, seas and atmosphere on our planet has given rise to a surprisingly stable climate over billions of years. Even so, relatively small changes to the Earth's attributes can (and do) cause mass extinctions, bringing our ecosystems to the brink of collapse.

Lucky Planet goes on to consider the violent fluctuations in climate in our past, revealed to us through geological strata. The sources of these fluctuations are both internal and external, with changes in the Earth's atmospheric composition and changes in the Earth's orbit (due to the gravitational forces of the other planets in the solar system) both capable of wreaking climatic havoc. On top of these challenges to life already present, Waltham contends that even the hardiest of organisms on Earth – the "extremophiles" that thrive at the far limits of terrestrial temperatures, acidities, salinities and radiation levels – would struggle to spontaneously come into existence without a relatively benign environment.

Waltham frames the arguments for and against ubiquitous extraterrestrial life in terms of two possible environmental scenarios. One, which he calls "Gaia" after James Lovelock's theory of planetary self-regulation, is that the Earth is adjusting itself for the benefit of the biosphere. The alternative scenario, which Waltham calls "Goldilocks", is that our current clement condition is merely a coincidence. As always, though, the universe is not so black and white: the Earth has a variety of feedback systems, some which stabilize the climate, and some which destabilize it. Waltham's examples of "Daisy World" (an imaginary planet where fields of black and white daisies compete to regulate the absorption of sunlight) and "Mouldy Pine World" (where pine trees and tree mould coexist in an unstable equilibrium, with out-of-control cycles of carbon-dioxide consumption and production if either species becomes more prevalent) demonstrate nicely how life can both help and hinder the Earth's attempts to provide clement weather.

The Earth, in other words, is a mix of "Gaia" and "Goldilocks". However, Waltham argues that there is more of the latter in the mix than the former, and we should be prepared for the possibility that complex life will be rare. As he puts it, "statistically, we are most likely to be living on a second-best world in a second-best universe." While there are many who would argue the opposite – that our planet is a "common or garden" world – we must remember that we are not objective observers. Our mere presence places constraints on our ability to determine how common we might be.

This book is a cogent reminder that to an astrobiologist, the Earth is more than just one data point in the study of life in the universe. While some sections of the book can be quite technical both in style and content, Waltham spices them with charming anecdotes from the history of geology, astronomy and biology, as well as his own personal experiences of studying the Earth's processes. Readers of Peter Ward and Donald Brownlee's Rare Earth, the most well-known recent book on this theme, will find a good deal of overlap; however, Ward and Brownlee took a much broader view of defining Earth-ness than Waltham does, and there have also been a great number of advances in the decade since Rare Earth was published. In particular, some concepts once thought to be well-established have become more complicated. For example, the presence of a large moon may not provide as stable a climate as once thought, and Waltham addresses this topic at length.

For those unfamiliar with astrobiology, this book is an excellent introduction, although some sections will be challenging to those without a scientific background. Also, given the current debates for and against ubiquitous extraterrestrial life, some further reading would be required to fully understand the field (Lucky Planet's "further reading" section provides several good examples of the other side of the argument).

Overall, though, Lucky Planet is a thoroughly enjoyable read despite its aim of challenging the more optimistic assessments of our chances of finding complex, perhaps even intelligent life elsewhere. I share Waltham's sentiments that while "many people might find this view of the universe set out in this book rather bleak, [it] has merely served to sharpen my appreciation of our stunning home world".

About the author

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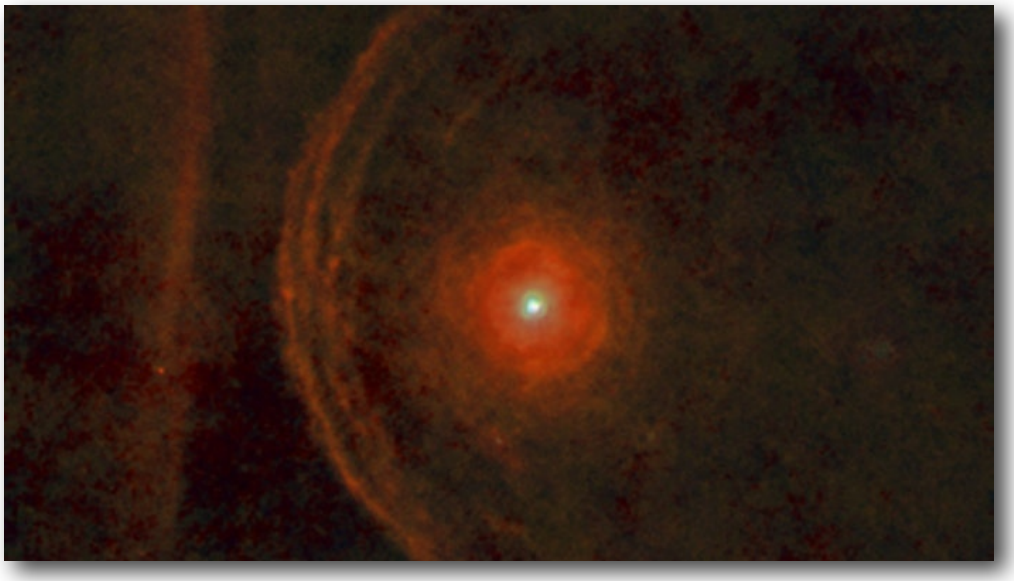
Betelgeuse Braces for a Collision From ESA January 2013 [http://www.esa.int/ESA]



Multiple arcs are revealed around Betelgeuse, the nearest red supergiant star to Earth, in this new image from ESA's Herschel space observatory. The star and its arc-shaped shields could collide with an intriguing dusty 'wall' in 5000 years.

Betelgeuse rides on the shoulder of the constellation Orion the Hunter. It can easily be seen with the naked eye in the northern hemisphere winter night sky as the orange–red star above and to the left of Orion's famous three-star belt.

Roughly 1000 times the diameter of our Sun and shining 100 000 times more brightly, Betelgeuse's impressive statistics come with a cost. For this star is likely on its way to a spectacular supernova explosion, having already swelled into a red supergiant and shed a significant fraction of its outer layers.

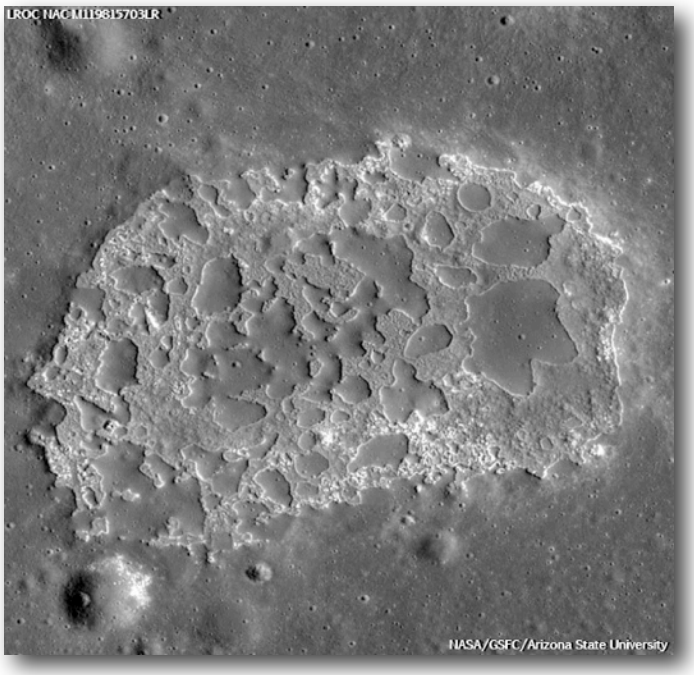
The new far-infrared view from Herschel shows how the star's winds are crashing against the surrounding interstellar medium, creating a bow shock as the star moves through space at speeds of around 30 km/s. A series of broken, dusty arcs ahead of the star's direction of motion testify to a turbulent history of mass loss.

Closer to the star itself, an inner envelope of material shows a pronounced asymmetric structure. Large convective cells in the star's outer atmosphere have likely resulted in localized, clumpy ejections of dusty debris at different stages in the past.

An intriguing linear structure is also seen further away from the star, beyond the dusty arcs. While some earlier theories proposed that this bar was a result of material ejected during a previous stage of stellar evolution, analysis of the new image suggests that it is either a linear filament linked to the Galaxy's magnetic field, or the edge of a nearby interstellar cloud that is being illuminated by Betelgeuse.

If the bar is a completely separate object, then taking into account the motion of Betelgeuse and its arcs and the separation between them and the bar, the outermost arc will collide with the bar in just 5000 years, with the red supergiant star itself hitting the bar roughly 12 500 years later.

Young Volcanoes on the Moon



Nov 24, 2014: Back in 1971, Apollo 15 astronauts orbiting the Moon photographed something very odd. Researchers called it "Ina," **(image right)** and it looked like the aftermath of a volcanic eruption. There's nothing odd about volcanoes since much of the Moon is covered with ancient hardened lava. But planetary scientists thought that lunar volcanism came to an end about a billion years ago. Yet Ina looked remarkably fresh. For more than 30 years Ina remained a mystery, a "one-off oddity" that no one could explain.
Now, using NASA's Lunar Reconnaissance Orbiter, a team of researchers led by Sarah Braden of Arizona State University has found 70 landscapes similar to Ina. They call them "Irregular Mare Patches" or IMPs for short.

"Discovering new features on the lunar surface was thrilling!" says Braden. "We looked at hundreds of high-resolution images, and when I found a new IMP it was always the highlight of my day." "The irregular mare patches look so different than more common lunar features like impact craters, impact melt, and highlands material," she says. "They really jump out at you." On the Moon, it is possible to estimate the age of a landscape by counting its craters. The older a landscape, the more craters it contains.

Some of the IMPs they found are very lightly cratered, suggesting that they are no more than 100 million years old. A hundred million years may sound like a long time, but in geological terms it's just a blink of an eye. The volcanic craters LRO found may have been erupting during the Cretaceous period on Earth--the heyday of dinosaurs. Some may be even younger, 50 million years old. "This finding is the kind of science that is literally going to make geologists rewrite the textbooks about the Moon," says John Keller, LRO project scientist at the Goddard Space Flight Center.

IMPs are too small to be seen from Earth, averaging less than a third of a mile (500 meters) across in their largest dimension. That's why, other than Ina, they haven't been found before. Nevertheless, they appear to be widespread around the nearside of the Moon. "Not only are the IMPs striking landscapes, but they also tell us something very important about the thermal evolution of the Moon," says Mark Robinson of Arizona State University, the principal investigator for LRO's high resolution camera. "The interior of the Moon is perhaps hotter than previously thought."
Credits: Author: Dr. Tony Phillips **| Production editor:** Dr. Tony Phillips **| Credit:** Science@NASA

Orion (Ori)

α–Orionis - Betelgeuse δ–Orionis - Mintaka
η–Orionis - Algjebbah β–Orionis - Rigel ε–Orionis - Alnilam
κ–Orionis - Saiph γ–Orionis - Bellatrix ζ–Orionis - Alnitak
λ–Orionis - Meissa

Orion is generally considered to be the most beautiful and imposing constellation in the heavens. It is easily recognized; the four bright stars forming a large rectangle and the three second magnitude stars, equally spaced and forming a straight line (the Belt of Orion) enclosed by the rectangle, are a delight to the eye. No other constellation has so many bright stars. Compare the colors of Betelgeuse, a giant red star, and Rigel, a brilliant blue-white star. Rigel has a magnitude of 0.3 and is the 7th brightest star in the sky; Betelgeuse has a magnitude of 0.9 and ranks 12th in brightness. Orion is in a portion of the sky that contains seven of the 20 brightest stars in the heavens; these are to be found in Orion, Auriga, Gemini, Taurus, Canis Major and Canis Minor [Winter Hexagon -ed].

There are two famous nebulae in Orion; one, the Great Nebula, is visible to the naked eye. It is the prototype of the diffuse nebulae; a great cloud of cosmic dust 26 light years in diameter and 1,625 light years away. θ–Orionis marks the center of the Great Nebula; viewed through binoculars, the star seems to be enveloped in a hazy field that marks the nebula's presence. Even in a small telescope, the Great Nebula is an awe-inspiring sight. The other famous nebula is the so-called "Horse's Head" Nebula, a dark nebula silhouetted against a glowing cloud of cosmic dust in the shape of a horse's head. This remarkable object is not visible-to the naked eye; long photographic exposures are required to show its details. The darkness of this cosmic cloud is due to the fact that there are no nearby stars to illuminate it. σ , θ and ι–Orionis mark the Sword of Orion. δ Orionis, the northernmost star in the Belt of Orion, lies almost exactly on the celestial equator. The Belt stars serve as valuable pointers; the line through them extended to the southeast points to Sirius and to the northwest, to Aldebaran in Taurus.

DOUBLE STARS

	Mag	Sep(s)	Location	Remarks
β	0.1-8.0	9	051**208**	White-Orange.
δ	2.5-6.9	53	053**000**	White-Lilac.
ζ	2.0-5.5-10	2.5-57	053**902**	Yellow-Blue.
η	3.6-5.0	1	052**302**	
θ	5 thru 11	-	053**305**	At least 7 stars in this multiple system; lies in the heart of the Great Nebula
ι	2.9-7.3-11	11-50	053**306**	In a fine field
λ	3.7-5.6 -10.9-11.8	4-29-78	053310	Yellow- Magenta; in fine field; quadruple
ρ	4.6-8.3	7	051103	Yellow-Blue.
σ	4.0-10.3 -7.5-6.3	11-13-42	053**603**	Grey-White-Blue-Red; beautiful quadruple
23	5.0-7.1	32	052003	
33	6.0-7.3	2	052903	
Σ627	6.3-7.0	2	045803	Striking.
Σ747	5.6-6.5	36	053**406**	
Σ750	6.0-8.0	4	053**304**	
Σ795	6.2-6.2	1.5	054506	
Σ816	6.2-8.7	4	055206	
Σ855	5.8-6.8-9.0	29-119	060603	Triple.

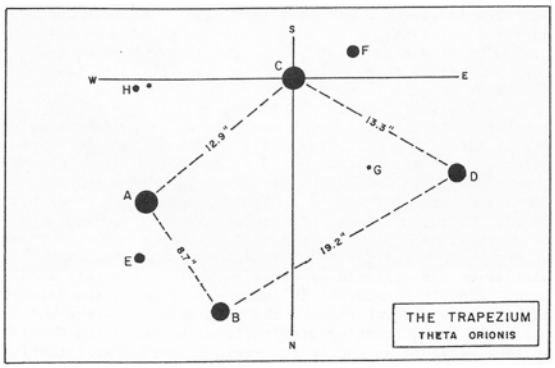
MESSIER OBJECTS

	Mag	Location	Remarks
M42	053**305**		Diffuse Nebula. The "Great Nebula"
M43	053**305**		Diffuse Nebula.
M78	054400		Diffuse Nebula.

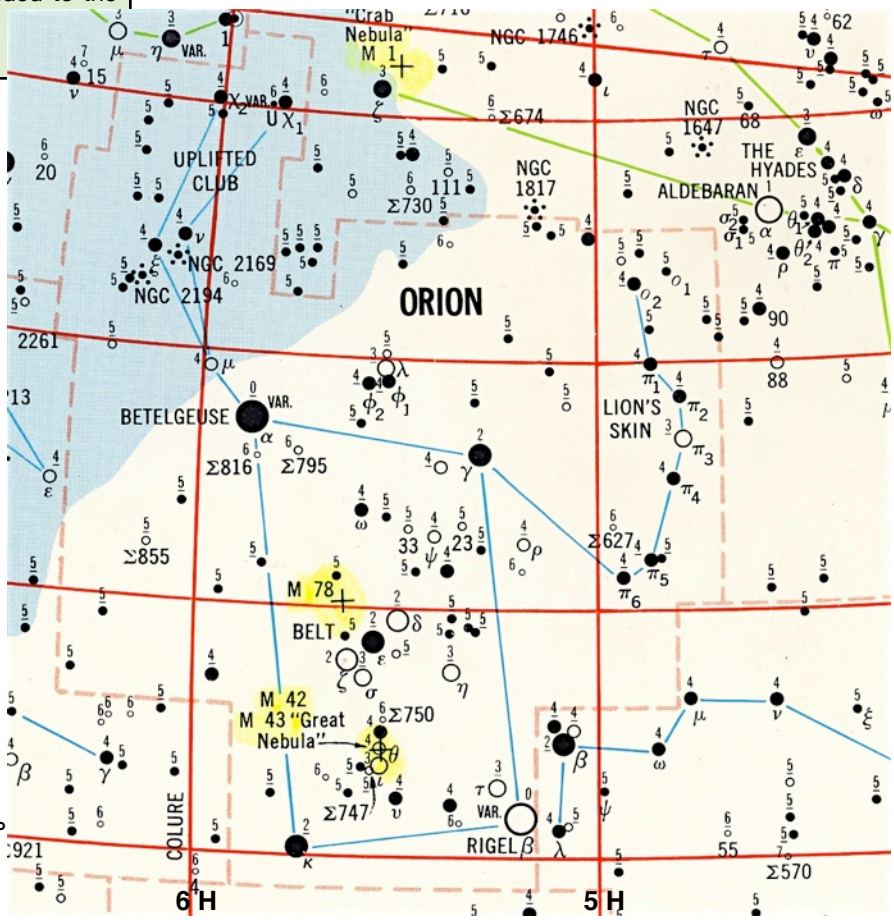
Objects of Interest in Orion

U Orionis - Long period (372 days) variable, max. magnitude 6.3. Location 055320.

Trapezium Cluster



The Trapezium Cluster at the heart of M42 consists of four easily observed stars named A thru D as in the Robert Burnham diagram above. Starry Night gives a magnitude for A of 4.96, B is 7.46, C is 5.06 and D is 6.37. Recently A and C have been found to be very close double stars and B is quadruple! Burnham's diagram also shows stars labelled E, F and G. The first two are about 11th magnitude and G is about 16, requiring a telescope 16" in diameter or larger. The entire cluster is about 4 ly across and contains about 1000 young stars. The large energy released powers the emission from the nebula that surrounds them. Imagine 1000 stars in the space between our Sun and α-Centauri! Awesome!



Date:		Times given in EST (24 h clock)
Jan 03	Sat	09:00 Quadrantid Meteors 120/h Moon close to FM
04	Sun	23:53 **FM** rises 16:58 EST locally
09	Fri	13:17 Moon at Apogee: 405 411 km
10	**Sat**	**17:30 Mercury-Venus:** 38 minutes apart in SW sky
13	Tue	04:47 **LQ Moon** rises locally at 12:42 EST
14	**Wed**	**15:00 Mercury at Greatest Elong: 18.9°E**
16	Fri	06:52 Saturn 1.9° S of Moon
20	Tue	08:14 **New Moon** rises locally at 07:33 EST
21	**Wed**	15:06 Moon at Perigee: 359 643 km
		18:00 Moon, Mercury, Venus triangle in W. Nice!
22	Thu	00:01 Venus 5.6°S of Moon
		23:40 Mars 3.9°S of Moon
23	**Fri**	**Double and Triple Shadow Transits on Jupiter** Double starts 23:34 EST Jan 23, triple from 01:27 to 01:52 Jan 24 morning
26	Mon	23:48 **FQ Moon** rises locally at 11:26 EST
29	Thu	11:30 Moon S. limb 7 min from Aldebaran (daytime)
30	Fri	09:00 Mercury Inferior Conjunction (in line with Sun)

BAS/Astronomy Events

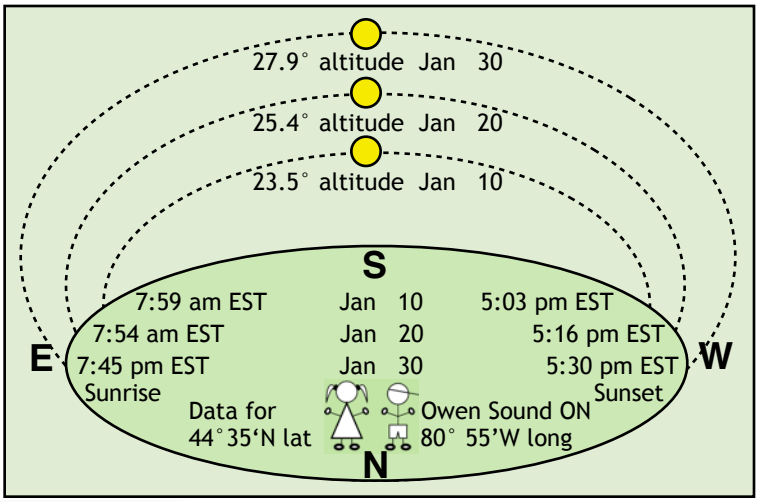
BAS meetings are not held in January and February but impromptu observing continues at the Fox Observatory on an individual or small group basis. To be put on the notification list email Brett T at <bretttatton@gmail.com>.
More details about the following events can be found on pg 13 or on the BAS website: www.bluewaterastronomy.info:

Jan 03	Sat	**Quadrantid Meteors** 120/h peak 9 am, Full Moon
Jan 10	**Sat**	**Mercury-Venus:** 38 minutes apart in SW sky. Look west after sunset
Jan 14	**Wed**	**Mercury at Greatest Elong: 18.9°E** farthest from Sun and easiest to observe. Look for Venus about 1° away. More about Mercury observing on pg. 3.
Jan 15	Thu	**New Horizons** spacecraft starts Pluto imaging.
Jan 20	Tue	**New Moon**
Jan 21	**Wed**	**Moon, Mercury, Venus triangle in West.** The three objects form a triangle with 6° sides. Nice! Note: Mars and Neptune are also nearby. Mars 15° east of Venus, Neptune a bit closer at 12°.
Jan 23	**Fri**	**Double and Triple Shadow Transits on Jupiter** Double starts 23:34 EST Jan 23, triple from 01:27 to 01:52 Jan 24. BAS viewing@Fox for sure Fri night/Sat morning if weather permits.

Planets

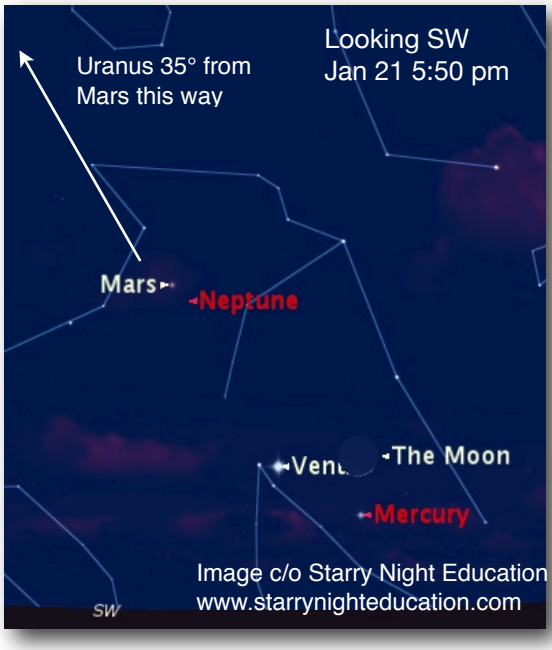
MERCURY, reappears in the west after sunset in Jan 2015 and is good viewing all month. It is **very** close to Venus on the 10th and, on Jan 21, Mercury, Venus and thin crescent Moon form a lovely triangle in the western sky. **VENUS,** (-3.9) is the bright Evening Star in the west now and gets higher and higher as January progresses. **MARS** (mag. 1.2) continues to stay above the western horizon and ends up in Aquarius in January. Look for it only 13 minutes of arc from Neptune on Jan 19. **JUPITER**, (-2.6) rises in the east at 8:15 pm at the start of January and around 6 pm at the end of the month. Jupiter viewing continues to be excellent with a triple shadow transit on Jan 23/24. **SATURN,** (mag. 0.6) rises by 3 am at month end. It is only a degree or so away from a last crescent moon on Jan 16. **URANUS,** (5.8) and **NEPTUNE,** (7.8) are evening sky objects and set by 7:30 pm and 10:30 pm respectively by month end. Both **asteroid, Vesta (7.1)** and dwarf planet, **Ceres (8.3)** are too close to the Sun for viewing this month. **PLUTO** (mag. 14) passes behind the Sun in early January and will not be visible for several months. Pluto 2015 charts will be on the BAS website once the planet becomes more easily visible.

The diagram below gives the sunrise/sunset times and the Sun's altitude for January 2015. The Sun is now rising again in elevation. The January moon phase graphic below shows lunar phases for each night of the month. Times of moonrise for NM, FQ, FM and LQ are given in the Sky Calendar listing at left.



Evening Planets

Look for **5 planets** in the evening sky in January, 2015. **Mercury, Venus, Mars, Neptune and Uranus**, appear along the ecliptic above the setting Sun in the SW. The speedsters are Mercury and Venus which appear early in January and climb towards Mars and Neptune all month. Mercury drops back towards the Sun on Jan 14 (GEE) but Venus eventually catches and passes Mars in late Feb. On two occasions, the group is joined by the crescent Moon which adds to the photo op. Have a look for the thin crescent in the same part of sky on Jan 21-23 and again from Feb 20 -22. Very pretty!



Jan 2015

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	By permission Univ. of Texas McDonald Obs.			1	2	3
4 FM	5	6	7	8	9	10
11	12	13 LQ	14	15	16	17
18	19	20 NM	21	22	23	24
25	26 FQ	27	28	29	30	31

BAS Member Loaner Scopes

Solar H-alpha scope now out on loan.

Our Lunt solar scope can be borrowed by BAS members but there is a waiting list! Contact Aaron to get your name on it. We now have a suitable mount for it as well. A short training session will be provided on pickup.

One 12-inch Dob available.

Only one 12-inch loaner telescope is available for free loan by members. The other is temporarily under repair. Other scopes like **8-inch dobsonians** are available, however. Contact John H. or Brett T. for availability. Scopes come in and out so keep checking with John or Brett if you are interested in a loaner.

SGN Classified Ads Section

(Now also on our website)

FOR SALE: Meade Lightbridge 16" Dobsonian

Azimuth bearing upgraded to Teflon and textured Formica bearing. Includes AstroZap shroud and Telrad unit finder. The truss tubes and castings were originally bright white! I recoated them in flat black header paint after a light sandblasting. I have also modified the Rocker/Base Assembly using "knock down" fasteners. This bulky assembly can be assembled or disassembled in about five minutes with one Allen key for flat storage in a car trunk. The Lower Optical Assembly will fit into the backseat of my Corolla. This is a relatively transportable "Light Bucket" priced at $1300. Make me an offer! Brett Tatton ph: (519) 389-6010 or: bretttatton@gmail.com

Note: Actual scope does not have a handle under focuser or reinforced base (near eyepiece rack) as shown in image above.

FOR SALE: Canon EF 20 mm f/2.8 USM lens

Field of view = 94° (along diagonal) filter size = 72 mm (Skylight 1B filter included) lens caps included. Asking $400. Call 519-371-0670 or contact stargazerjohn@rogers.com. Review at: http://www.photozone.de/Reviews/151-canon-ef-20mm-f28-usm-lab-test-report--review

FOR SALE: Canon EOS T-adapter

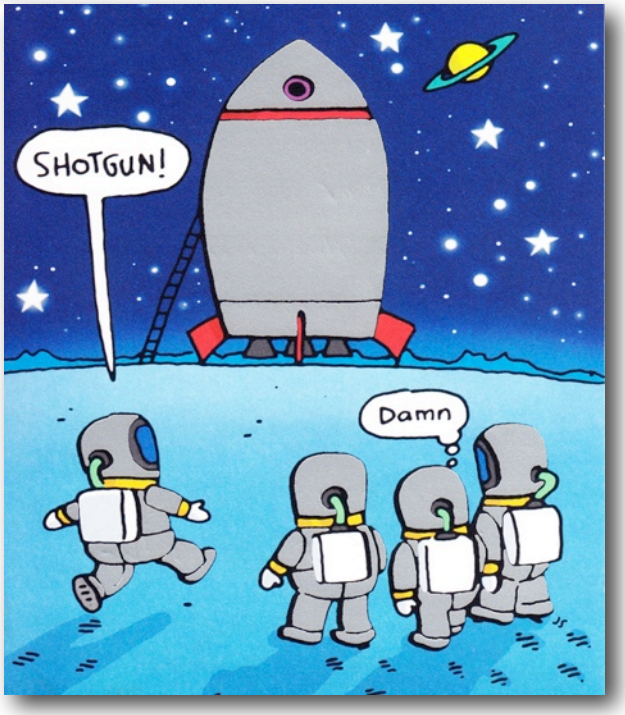
Connect your Canon camera to other components with a T-adapter. Bayonet mount connects directly to camera body. Other end has a removable threaded section that can be replaced with a 2-inch barrel for a 2-inch eyepiece holder. Contact John at 519-371-0670 or at stargazerjohn@rogers.com. I can do some machining to customize this item to your telescope as well (for a small fee/materials cost).

FOR SALE: Televue Pronto

Price reduced to $600 !

2 element E.D. Refractor, 2.7" / 70mm diameter. f.l. 480mm, f/6.8. with 1-1/4" Star Diagonal, with 45 degree Prism diagonal (for terrestrial viewing), with TeleVue Red dot finder, complete with TeleVue Soft Case. Contact Anton VanDijk 519 376-9912 ravand@rogers.com

The Cartoon Corner



Holiday Snow Angel Recorded by Hubble

12.06.11

NASA's Hubble Space Telescope presents a festive holiday greeting that's out of this world. The bipolar star-forming region, called Sharpless 2-106, looks like a soaring, celestial snow angel. The outstretched "wings" of the nebula record the contrasting imprint of heat and motion against the backdrop of a colder medium.

Image of the Month

There are so many spacecraft recording the cosmos with cameras that it is never a problem to find a spectacular image to feature on a monthly basis. In future issues of SGN, this page will present an especially interesting (and sometimes seasonally appropriate) image taken by one of those spacecraft. Enjoy!

Sharpless 2-106, Sh2-106 or S106 for short, lies nearly 2,000 light-years from us. The nebula measures several light-years in length. It appears in a relatively isolated region of the Milky Way galaxy.

A massive, young star, IRS 4 (Infrared Source 4), is responsible for the furious activity we see in the nebula. Twin lobes of super-hot gas, glowing blue in this image, stretch outward from the central star. This hot gas creates the "wings" of our angel.

A ring of dust and gas orbiting the star acts like a belt, cinching the expanding nebula into an "hourglass" shape. Hubble's sharp resolution reveals ripples and ridges in the gas as it interacts with the cooler interstellar medium.

Dusky red veins surround the blue emission from the nebula. The faint light emanating from the central star reflects off of tiny dust particles. This illuminates the environment around the star, showing darker filaments of dust winding beneath the blue lobes.

Detailed studies of the nebula have also uncovered several hundred brown dwarfs. At purely infrared wavelengths, more than 600 of these sub-stellar objects appear. These "failed" stars weigh less than a tenth of our Sun. Because of their low mass, they cannot produce energy through nuclear fusion like our Sun does. They encompass the nebula in a small cluster.

The Hubble images were taken in February 2011 with the Wide Field Camera 3. Visible narrow-band filters that isolate the hydrogen gas were combined with near-infrared filters that show structure in the cooler gas and dust.