



*Astronomy News for Bluewater Stargazers*  
*Vol 10 No.1 January 2016*

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- \*Note: Quetican FoV: Doug's column returns in Feb 2016



Marie Skłodowska-Curie  
(1867-1934)

*Radioactivity pioneer, two-time Nobel laureate*

A giant of science, Marie Skłodowska-Curie conducted pioneering research on radioactivity, a term she coined. She discovered two elements, founded two medical research centres, won two Nobels, and invented mobile X-ray units (dubbed *petites Curies*), saving countless lives in World War I.



INTERNATIONAL  
YEAR OF LIGHT  
2015

Perimeter Institute in Waterloo, ON, has issued a series of posters honouring Women in Physics. SGN 2016 issues will continue to feature women who have made major contributions to astronomy and physics.

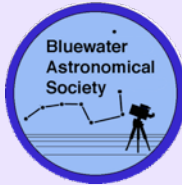
### Pre-Christmas Aurora seen in Alberta

In spite of many alerts received on Dec 20/21 from Spaceweather.com, no northern lights were seen in Grey/Bruce Counties or anywhere in Ontario for that matter, to my knowledge. A large mass of clouds/overcast hid the skies for us locally, but one of our far-flung contacts, Troy Johnstone did image the auroral display on Dec 20 from near Airdrie, Alberta. The shot below was taken before midnight with a Nikon D700, a 10 second exposure at f/3.5 ISO 800, focal length 14 mm. The bowl of the Big Dipper is visible centre left and the head of Leo the Lion is rising in the centre of the image behind the aurora. See TroyJohnstone.com for more of Troy's excellent images. Also have a look at the Image of the Month pg 12 for another view of an Alberta aurora.



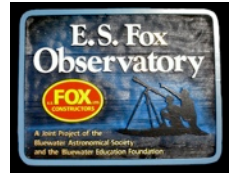
TROYJOHNSTONE.com  
PHOTOGRAPHY

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- Co-Presidents:** John Hlynialuk [stargazerjohn@rogers.com](mailto:stargazerjohn@rogers.com)  
Aaron Top [aarontop@hotmail.com](mailto:aarontop@hotmail.com)
- Vice-President:** Zoë Kessler [zoe@zoekessler.com](mailto:zoe@zoekessler.com)
- Secretary:** Lorraine Rodgers [lrodders@bmts.com](mailto:lrodders@bmts.com)
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- Membership:** David Skelton [dskel@golden.net](mailto:dskel@golden.net)
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- Member-at-Large:** Robert Atkinson [robotbo@gmail.com](mailto:robotbo@gmail.com)



**BAS & Astronomy Events for January**

- Jan 1 Fri** Happy New Year! Catalina and Arcturus separation 0.5 degrees.
- Jan 2 Sat** LQ
- Jan 4 Mon** Quadrantid Meteors 120/h peaking 3:00 am.
- Jan 6 Wed** **NO BAS meeting** tonight. Join us March 2, 2016 for our first regular 2016 meeting.
- Jan 9 Sat NM** Venus - Saturn 20 min of arc apart in morning sky
- Jan 15 Fri** Comet Catalina near Alkaid (eta-UMa). Catalina becomes circumpolar Jan 13
- Jan 16 Sat** FQ
- Jan 19 Tue** Aldebaran occultation Dispp: 9:13 pm, Reapp;10:31 pm EST Gibbous Moon
- Jan 23 Sat** FM
- Jan 31 Sat** LQ



**Getting the LEDs Out -part 2**

by John Hlynialuk

In this final part of the article (see part 1 in SGN July 2015), measurements are presented of the lighting levels as measured by an iPhone app called LuxMeter by Pavel Bukhonov (available at the App Store). About 4 dozen old fixtures (pre-changeover) were measured in several locations on Owen Sound. The measurements were taken again after the new LED fixtures had been installed. Results are presented for 20 streetlights on page 3.

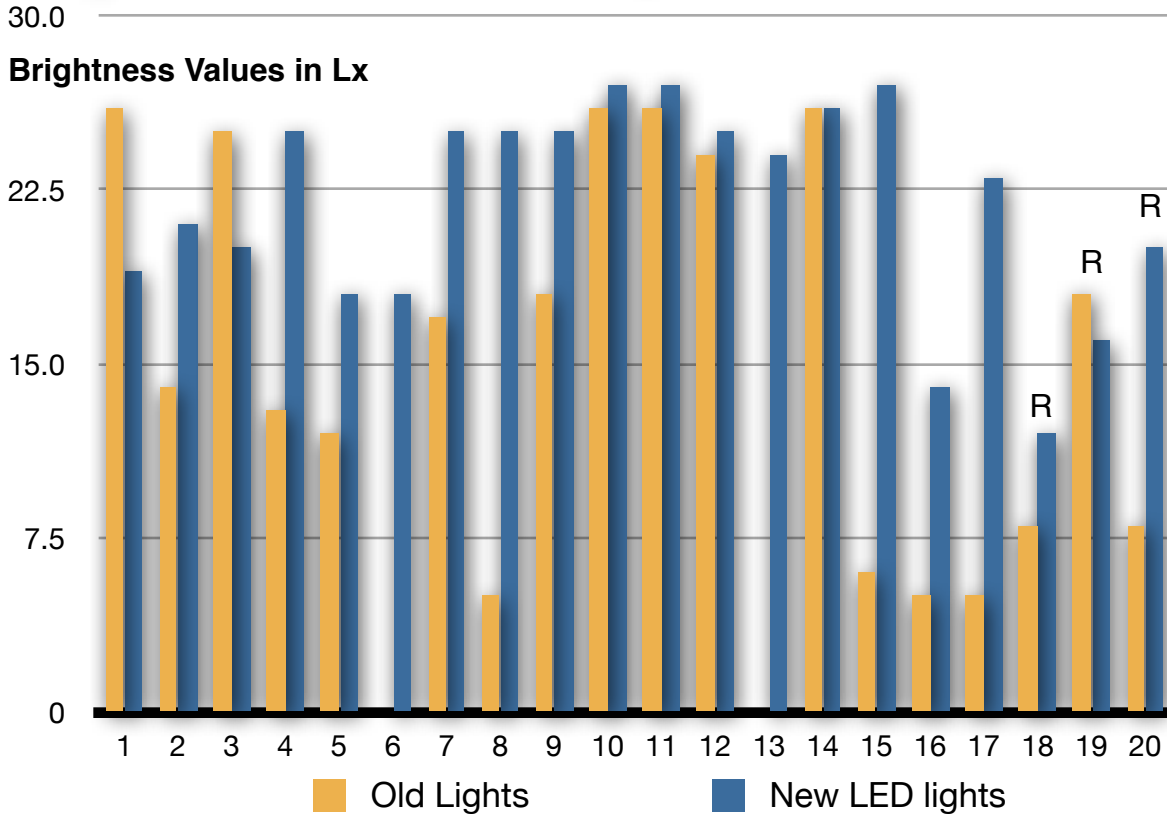
Note that the original lights were a variety of types as described in part 1 of this reports (see pg 11, July 2015 SGN) but those measured for comparison purposes were mainly streetlights of the type shown in the upper right corner on page 11, and described as "first round of replacements... with full cutoff fixtures". None of the other lights shown on page 11 of the July issue identified as Figs. A through F were included in the data on page 3.

The intensity of illumination is only one factor. The wavelength of light emitted is just as critical. LEDs come in a variety of "colour temperatures", CCT or Correlated Color Temperature. In an email from a city hall official I was told the Owen Sound LEDs were 4000 K lights and not the more blue 5000 K lights that were being used in other cities before these "warmer" LEDs were available. (See chart bottom of pg 3.)

The bottom line in Owen Sound is that the brightness has increased by about 30% but at least the CCT is close to the 3000K recommended by the IDA (International Darksky Association).

The two LED light fixtures pictured above left and below illustrate how in light levels was varied by using fewer LEDs in the fixture. Most of the main thoroughfares in Owen Sound like the 6th St E hill which connects the downtown to the exit routes from Owen Sound have 10 lamps per fixture. Residential streets like 7th and 8th Ave. E have the lower output fixtures (5 lamps). This is marked on the chart below by "R" above the last three bars.





**Old Lights vs New LEDs Owen Sound**

Bar chart of old vs new lights clearly shows that the general illumination has increased. Average brightness went from 14.10 lx to 21.85 lx. It is likely that the old lights had aged and their output has decreased with time -a characteristic of LPS lights. Some were not even functioning (#6 and #13). The average would be skewed downwards somewhat for this reason (14.1 vs 15.7 lx). With the new LEDs, brightness is not likely to fade with age as they tend to put out their full illumination until they fail totally. Of the 20 luminaires compared before and after, only 3 (#1, 3 & 19) were less intense after replacement.

- Note 1:** #6 and #13 old lights were not operating on date of measurement
- Note 2:** "Old" values obtained Dec 28, 2014, "New" values Dec 10, 2015. No snow on the ground both dates.
- Note 3:** "R" refers to lights 18,19, 20 on 8th Av E, & 6th St "A" E, residential streets (5 bulb fixtures)
- Note 4:** Lights 1 to 17 are located on 6th St E, a main route (10 bulb fixtures)
- Note 5:** All measurements were done at chest level from the ground. No fixture heights appear to have been change during replacement.

**The Bottom Line:**

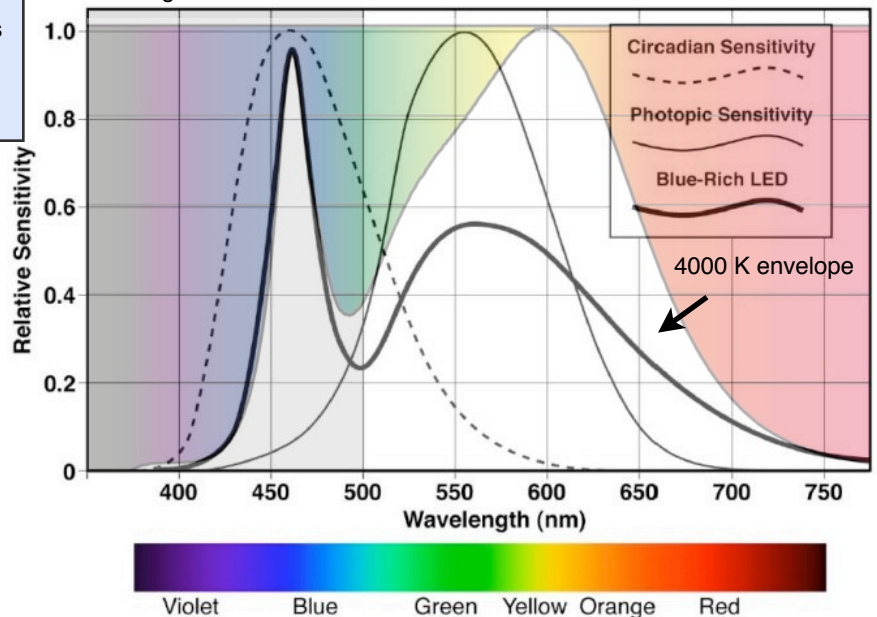
The "darker sky movement" in general has received no good news in the changeover to LEDs in Owen Sound. If the 30% increase in illumination is general across the city, then we have in fact, gone backwards. In addition no changes are planned for the worst offenders, the non-shielded lights in the downtown core areas and the surrounding townships like Georgian Bluffs have not addressed the existing over-illumination at the car dealerships on the east side. Furthermore, commercial lighting is increasing in the

areas east, west and south of Owen Sound as new stores light up their parking lots and storefronts.

On the plus side, at least the colour temperature of the Owen Sound LEDs is closer to the recommended value of 3000 K and taxpayers will eventually be paying less for more night time illumination of our streets. (I am not holding my breathe for a drop in my tax bill). Also, on the plus side, is the fact that it is possible to adjust the light output of LED lights. Whether the city will do this will probably depend on how much citizens complain about the light levels.

Please feel free to contact the author of this article at [stargazerjohn@rogers.com](mailto:stargazerjohn@rogers.com) with any comments. City officials can be reached at the Owen Sound municipal offices at [cityadmin@owensound.ca](mailto:cityadmin@owensound.ca). Environmental Superintendent Chris Hughes can be reached at [chughes@owensound.ca](mailto:chughes@owensound.ca)

As the graph at right shows, human visual sensitivity is primarily in the green and yellow part of the spectrum (photopic sensitivity curve). Light in the blue portion of the color spectrum below 500 nm, such as that produced by a phosphor-converted "blue-rich" LED, has a limited usefulness to the human eye. This blue light also falls within the circadian rhythm curve (light which affects the human day/night cycle). The International Darksky Association (IDA) recommends limiting blue light below 500 nm, as indicated by the gray shaded area of the graph. The colour of light emitted by a typical bluish-white 5500 K LED is depicted by the bold line. A 4000K LED is shown by the white area. Note that a larger proportion of this light is in the yellow end of the spectrum. IDA recommends even lower spectral colour of 3000K.



## POLAR STRATOSPHERIC CLOUDS

This week, sky watchers are reporting an outbreak of polar stratospheric clouds (PSCs) around the Arctic Circle. Unlike normal grey-white clouds, which hug Earth's surface at altitudes of only 5 to 10 km, PSCs float through the stratosphere (25 km) and they are fantastically colorful. Truls Tiller photographed these over Tromsø, Norway, on **Dec. 16th**. (Right)

"Here the sun is gone for now," says Tiller, "but this beautiful view makes the winter darkness nice to be in as well. The picture was taken at 10.30 am, in the middle of the 'day.'"

Also known as "nacreous" or "mother of pearl" clouds, the icy structures form in the lower stratosphere when temperatures drop to around minus 85°C. High-altitude sunlight shining through tiny ice particles ~10µm across produce the characteristic bright iridescent colors by diffraction and interference. Once thought to be mere curiosities, some PSCs are now known to be associated with the destruction of ozone.

"Nacreous clouds far outshine and have much more vivid colours than ordinary iridescent clouds, which are very much poor relations and seen frequently all over the world," writes atmospheric optics expert Les Cowley. "Once seen they are never forgotten."

Report from [www.spaceweather.com](http://www.spaceweather.com)



## Neil deGrasse Tyson receives Cosmos Award



Planetary Society co-founder Carl Sagan fueled the imagination of millions of viewers around the world with his landmark television series, *Cosmos*. In his honor, The Society created the esteemed Cosmos Award to recognize innovators who follow in this tradition of presenting science and scientists in an accurate, yet entertaining and enthralling way. Neil deGrasse Tyson, was presented with the Cosmos Award at the Planetary Society's 35th Anniversary celebration in October.

As an astrophysicist and author, Neil led a new generation of explorers on his *Ship of the Imagination* in a re-envisioning of *Cosmos*. Neil also hosts *StarTalk Radio*, a podcast and TV show about space and science and serves as the Director of the world-renowned Hayden Planetarium in New York City. And, of course, Neil has served on the Board of Directors of The Society for 19 years.

Neil encourages us all to foster our innate curiosity, to "...Dream big, dream of tomorrow, long for the open seas." The Society's mission aims to find our place in space. We've come a long

way in a relatively short time but, my friends, there's much more to explore! What inspires you to explore?

The Planetary Society website is <http://planetary.org/>

## Canadian Instrument Delivered for 2016 Asteroid Sample Return Mission

A sophisticated laser-based mapping instrument has arrived at Lockheed Martin Space Systems in Denver for integration onto NASA's Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) spacecraft.

The OSIRIS-REx Laser Altimeter (OLA), contributed by the Canadian Space Agency (CSA), will create 3-D maps of asteroid Bennu to help the mission team select a sample collection site.

"The OSIRIS-REx Project has worked very closely with our partner CSA and their contractor MDA to get this critical instrument delivered to the spacecraft contractor's facility," said Mike Donnelly, OSIRIS-REx project manager from NASA's Goddard Space Flight Center in Greenbelt, Maryland. "We are very pleased with the performance of the instrument and look forward to its contribution to our mission."

OLA is an advanced LIDAR (Light Detecting and Ranging) system that will scan the entire surface of the asteroid to create a highly accurate, 3-D shape model of Bennu. This will provide mission scientists with fundamental data on the asteroid's shape, topography (distribution of boulders, rocks and other surface features), surface processes and evolution. An accurate shape model will also be an important tool for navigators as they maneuver the OSIRIS-REx spacecraft around the 500-meter-wide asteroid. In exchange for providing the OLA instrument, CSA will receive a portion of the returned asteroid sample for study by Canadian scientists.

"OLA will measure the shape and topography of Bennu to a much higher fidelity and with much greater efficiency than any planetary science mission has achieved," said Michael Daly, OLA instrument lead at York University, Toronto. "This information is essential to understanding the evolution and current state of the asteroid. It also provides invaluable information in aid of retrieving a sample of Bennu for return to Earth."

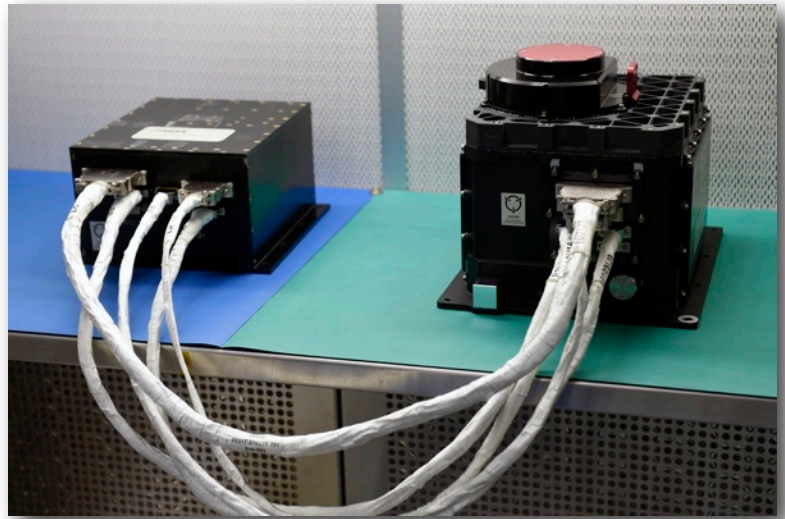
After launch in September 2016, the OSIRIS-REx spacecraft will travel to the near-Earth asteroid Bennu and bring at least a 60-gram sample back to Earth for study. Scientists expect that Bennu may hold clues to the origin of the solar system and the source of water and organic molecules that may have made their way to Earth. OSIRIS-REx's investigation will also inform future efforts to develop a mission to mitigate an asteroid impact on Earth, should one be required.

"The data received from OLA will be key to determining a safe sample site on Bennu," said Dante Lauretta, principal investigator for OSIRIS-REx at the University of Arizona, Tucson. "This instrument is a valuable addition to the spacecraft, and I appreciate our Canadian partners' hard work and contribution to the OSIRIS-REx mission."

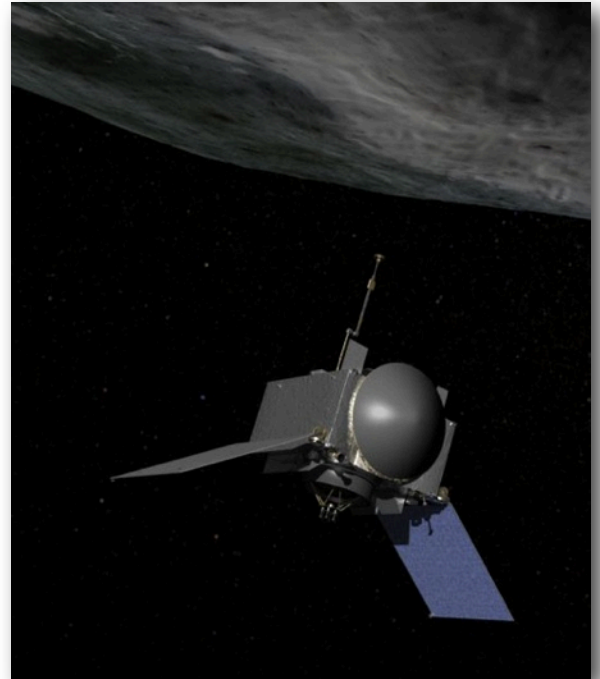
The laser altimeter was built for CSA by MacDonald, Dettwiler and Associates Ltd. (MDA) and its partner, Optech. OSIRIS-REx is scheduled to ship from Lockheed Martin's facility to NASA's Kennedy Space Center, Florida in May 2016, where it will undergo final preparations for launch.

For more information on OSIRIS-REx visit: <http://www.nasa.gov/osiris-rex> and <http://www.asteroidmission.org>

Nancy Neal Jones



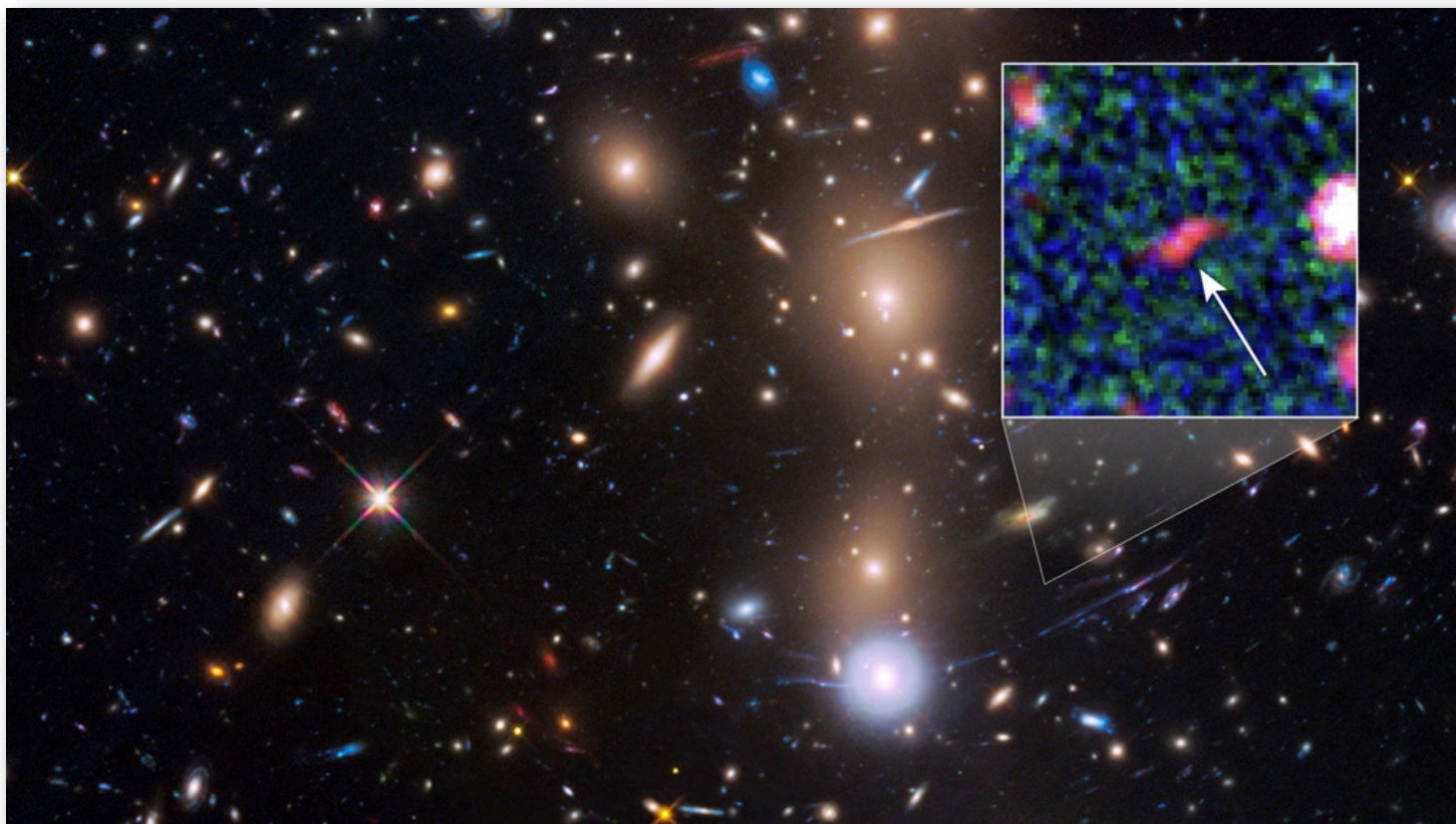
The OSIRIS-REx Laser Altimeter (OLA), contributed by the Canadian Space Agency, will create 3-D maps of asteroid Bennu to help the mission team select a sample collection site. NASA's OSIRIS-REx spacecraft will travel to the near-Earth asteroid Bennu and bring at least a 60-gram (2.1-ounce) sample back to Earth for study. **Credits: NASA/Goddard/Debbie McCallum /NASA**



### What's So Special About Bennu?

With a girth of about 500 m, Bennu is a larger than average Earth-approaching asteroid. It orbits around the sun every 436 days (1.2 years) and passes close to the Earth every six years. During those close approaches, Bennu comes within 448,794 of Earth, just beyond our Moon's orbit. Calculation of its future orbits indicate it has one of the highest impact probabilities in the next few centuries of any known asteroid, -a **1 in 1800 chance** of impact with Earth on September 24, 2182. Another study by mathematician Andrea Milani reveals eight potential hit opportunities between 2169 and 2199. Little Bennu could turn into an angry bird. So scientists need to study the asteroid up close to learn more about asteroids per se, but also to precisely determine its orbit and composition. In particular, we need to know how solar heating affects Bennu's orbit. Something as simple as baking in the afternoon sun can have dramatic consequences over an asteroid's lifetime. See more at: <http://astrobob.areavoices.com/2013/08/20/why-you-should-care-about-asteroid-101955-bennu/>

## Hubble Space Telescope sees Faintest Galaxy from Early Universe



Astronomers harnessing the combined power of NASA's Hubble and Spitzer space telescopes have found the faintest object ever seen in the early universe. It existed about 400 million years after the big bang, 13.8 billion years ago.

The team has nicknamed the object Tayna, which means "first-born" in Aymara, a language spoken in the Andes and Altiplano regions of South America.

Though Hubble and Spitzer have detected other galaxies that are record-breakers for distance, this object represents a smaller, fainter class of newly forming galaxies that until now had largely evaded detection. These very dim objects may be more representative of the early universe, and offer new insight on the formation and evolution of the first galaxies.

"Thanks to this detection, the team has been able to study for the first time the properties of extremely faint objects formed not long after the big bang," said lead author Leopoldo Infante, an astronomer at the Pontifical Catholic University of Chile. The remote object is part of a discovery of 22 young galaxies at ancient times located nearly at the observable horizon of the universe. This research means there is a substantial increase in the number of known very distant galaxies.

The results are published in the December 3 issue of *The Astrophysical Journal*.

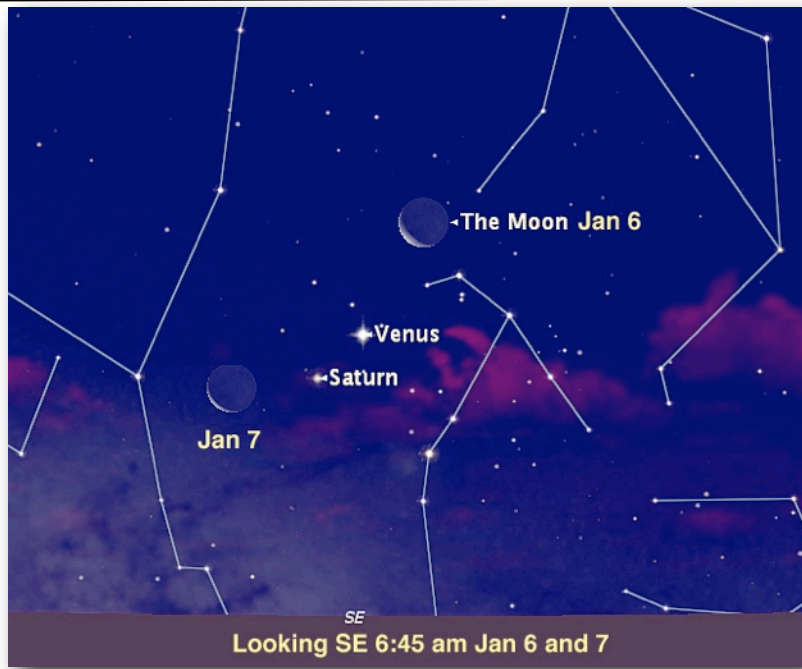
The new object is comparable in size to the Large Magellanic Cloud, a diminutive satellite galaxy of our Milky Way. It is rapidly

making stars at a rate 10 times faster than the Large Magellanic Cloud. The object might be the growing core of what will likely evolve into a full-sized galaxy.

The small and faint galaxy was only seen thanks to a natural "magnifying glass" in space. As part of its Frontier Fields program, Hubble observed a massive cluster of galaxies, MACS0416.1-2403, located roughly 4 billion light-years away and weighing as much as a million billion suns. This giant cluster acts as a powerful natural lens by bending and magnifying the light of far more distant objects behind it. Like a zoom lens on a camera, the cluster's gravity boosts the light of the distant proto-galaxy to make it look 20 times brighter than normal. The phenomenon is called gravitational lensing and was proposed by Albert Einstein as part of his General Theory of Relativity.

The galaxy's distance was estimated by building a color profile from combined Hubble and Spitzer observations. The expansion of the universe causes the light from distant galaxies to be stretched or reddened with increasing distance. Though many of the galaxy's new stars are intrinsically blue-white, their light has been shifted into infrared wavelengths that are measurable by Hubble and Spitzer. Absorption by intervening cool intergalactic hydrogen also makes the galaxies look redder.

This finding suggests that the very early universe will be rich in galaxy targets for the upcoming James Webb Space Telescope to uncover. Astronomers expect that Webb will allow us to see the embryonic stages of galaxy birth shortly after the big bang.

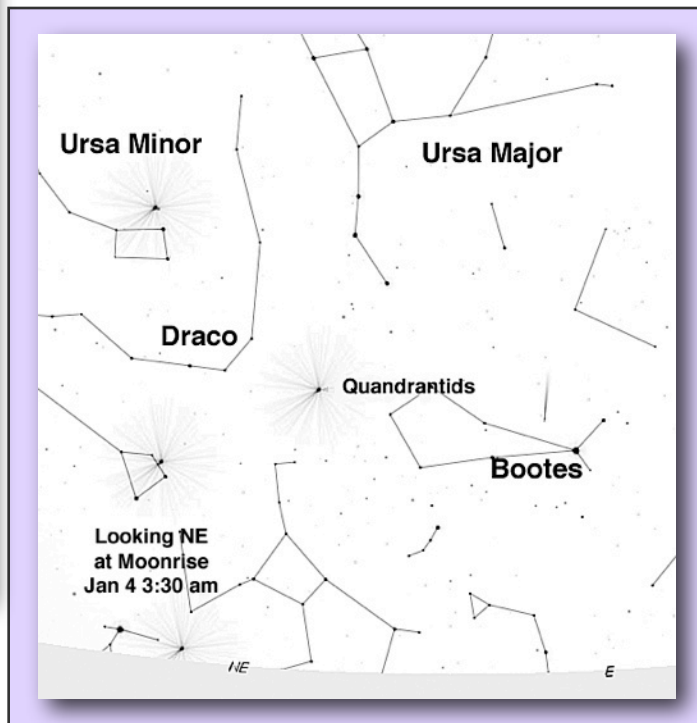
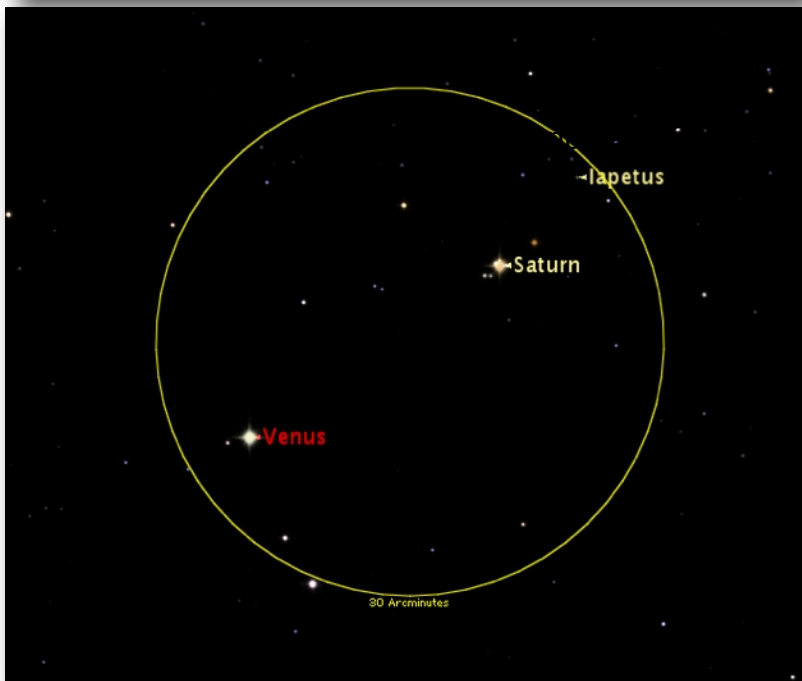


### Venus/Saturn Appulse Jan 9

On the mornings of Jan 6 and 7, 2016, a pretty collection of objects can be seen in the east. The view includes both a last crescent Moon and not one, but two planets, Venus and Saturn. Look for the Moon above the pair of planets Jan 6 and below the pair Jan 7. But note also that Venus and Saturn are changing positions too.

Watch as the brighter planet of the two, Venus, “swoops” down on Saturn and slips past on Jan 8 (Venus above Saturn) and Jan 9 (Venus below Saturn). On Jan 9, when they are closest, (image centre left) you will have to look carefully with the naked eye to see the two as separate objects. Try a pair of binoculars if you have trouble. On both of those mornings, the Moon – planet group is well above the horizon by 6:30 am and you should have no trouble seeing “earthshine” on the Moon’s unlit face.

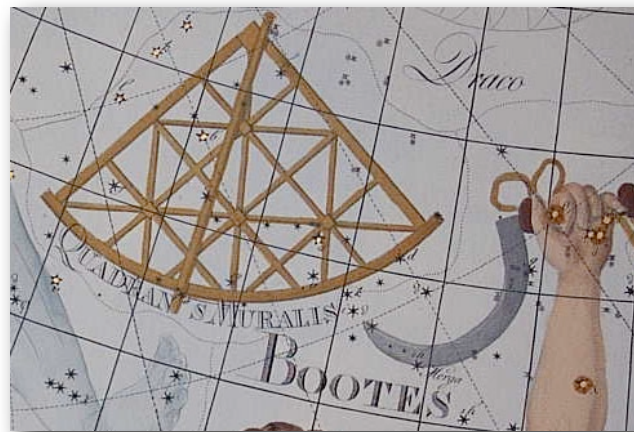
**Image centre left:** Venus and Saturn separation starts at about 17 min 45 s of arc when they rise (5:17 am EST Owen Sound), and increases to 25 min or so by sunrise at 7:59 am EST. At minimum separation, the two were a scant 5 minutes of arc apart but below our horizon. See more on page 9.



### Quadrantid Meteors

The last crescent Moon will not cast too much background light into the sky to obscure some of the fainter Quadrantids this year, so close to the 120 per hour maximum may be seen. This is an usual shower in that it lasts for only a few hours not the days that other showers stretch over. And as it turns out North America is in prime position to receive what the Quadrantids have to offer. Start watching these by midnight and continue to dawn (or let your camera do the watching). Diagram centre right shows the Quadrantid radiant at 3:30 am when it is about 35 degrees high.

A modern (but obsolete) constellation created by the French astronomer Joseph Jerome le Francais de La Lande in 1795. The constellation represents the mural quadrant, an astronomical instrument that he and his nephew used to plot and observe stars. Quadrans Muralis was created from stars found to the north of Bootes, the herdsmen; just behind the tail of the great bear of Ursa Major. The constellation is no longer recognized by astronomers, but the meteor shower peaking January 4, the Quadrantids, is still named after this constellation. (Wikipedia)



## Venus-Saturn Appulse Jan 9, 2015

The June appulse of Venus with Jupiter is being repeated this month with another planet, Saturn this month and the separation at minimum is almost the same. The scene is the morning sky during a wintery month so the odds are that it will not be seen as easily as the event last summer. But here is what you need to know to be successful.

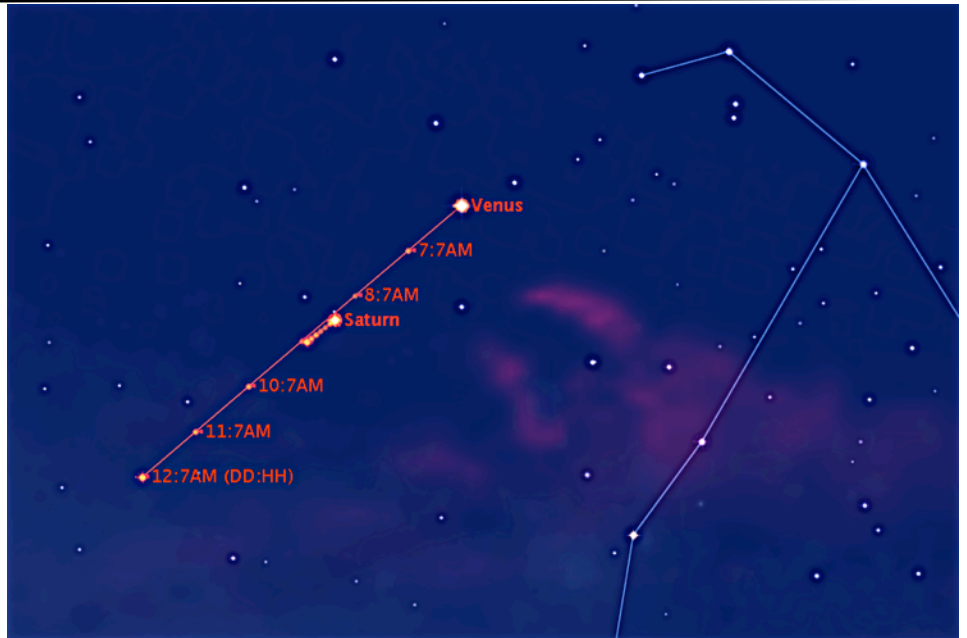
These are two bright planets which will be visible even during dawn twilight, so the odds are better for a successful observation. You might even try for a daylight observation. Saturn at magnitude 0.5 should be visible in daylight. And Venus at -4.0 can be a useful guide to locating the ringed planet. Hope for clear daytime skies in the first week of January. During the 3 night interval in the chart, Venus will have moved  $3^{\circ} 39'$  while Saturn will have crept along a mere  $18' 24''$  or less than one tenth as far.

Venus moves very quickly and the separations will change markedly during the time around minimum separation. Starry Night shows the closest point is at 11:04 pm EST with the separation a mere  $5' 04''$ . At that time Venus/Saturn are still well below the horizon and not due to appear in our dawn sky for another 6 hours plus. To give you a sense of the distance between the two planets, Iapetus, one of Saturn's moons is almost 2 minutes farther from the ringed planet at the time.

By the time the Saturn/Venus pair rise above the eastern horizon at 5:18 am EST locally, the spacing has increased to  $17' 40''$ . During the daylight trip across the sky until the pair sets in the west at 2:28 pm EST, Venus will have increased the separation to  $42' 49''$ . Note

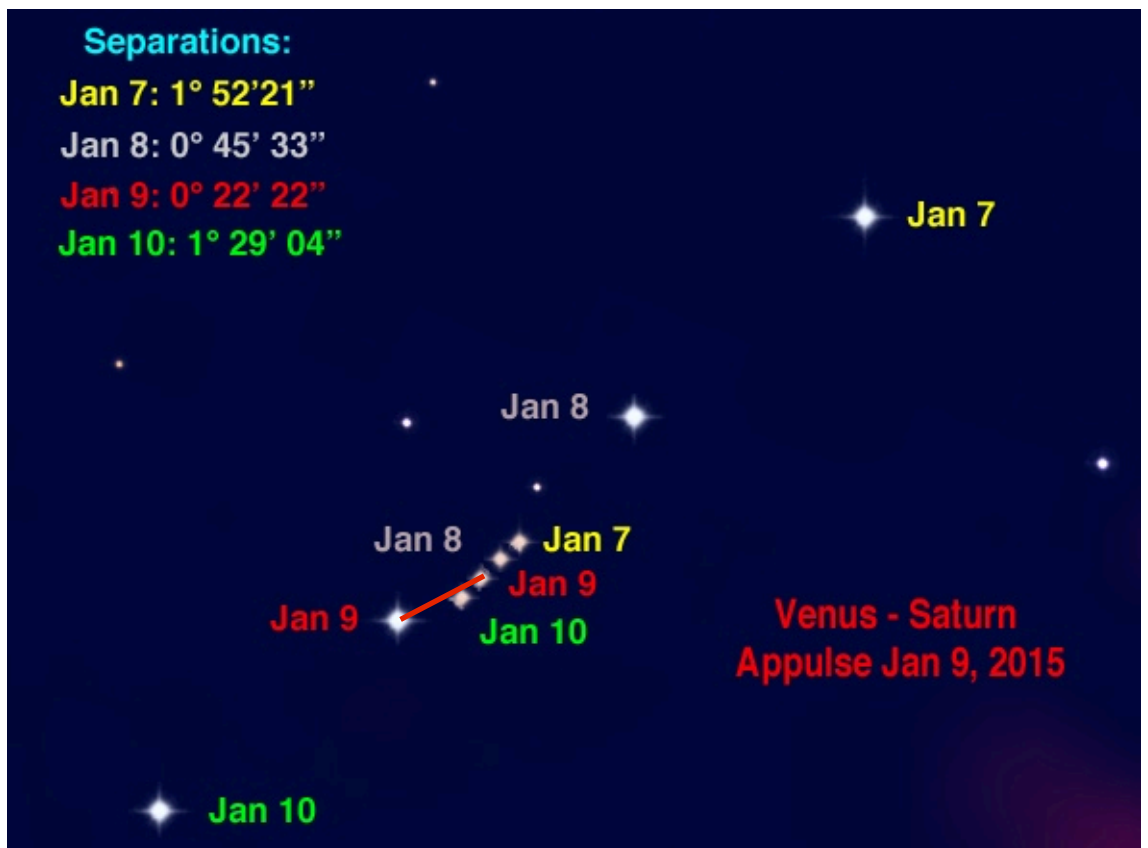
Needless to say, reports of successful observations would be appreciated at SGN. At medium to higher power, both the rings of Saturn and the phase of Venus should be easy to pick out. The rings will be tilted at an angle of  $26^{\circ}$  or more from now to July 2016 but this is countered by the fact that we are on the far side of our orbit from Saturn. Opposition is not until June 3, 2016 when its disk (and rings) will be largest.

As for Venus, the phase of the planet is gibbous and waxing towards a full disc also in June, but by then Venus is on the opposite side from the Sun from Earth. Just by happy coincidence the disks of the two planets are close to the same size about 15 arc-seconds. By June, Venus shrinks to 10 " and Saturn grows to 18 " across.



that the spacing is about the same on the previous night Jan 8 since Venus is on the west side of Saturn. As mentioned previously, the closest pass is during a time when the planets are below our horizon.

The diagram below is colour-coded to help keep the planet positions sorted out with red indicating the date of closest approach for us in North America. A telescope at moderate power will show both planets in the FOV on Jan 9. The distance between the Venus positions on Jan 7 and 8 are about one degree to give you a sense of the scale. For example, an 8-inch dob with 1200 mm focal length will show both planets in a 10 mm eyepiece at closest approach for us on Jan 9!



**Triangulum (Tri)** α-Trianguli - Rasalmothallah

Triangulum is a small constellation lying between Aries and Andromeda. Its three stars, although not very bright, stand out quite clearly as there are no other bright stars in the area. α-Trianguli is sometimes called "Caput Trianguli," the head of the triangle.

**DOUBLE STARS**

	Mag.	Sep'n (s)	Location	Remarks
ι	5.0-6.4	4	021030	Yellow-Blue; beautiful.

**MESSIER OBJECTS**

	Mag	Location	Remarks
<b>M 33</b>	6.1	013130	Spiral Galaxy, very large and faint, use low power. Image below.

**Other Objects of Interest (Sag)**

**R Trianguli** - Long period (266 days) variable, magnitude range 5.3-12.0. Location 023434.

**Aries (Ari)** γ-Arietis - Mesarthim

Even though its four most prominent stars lie well to the north of the ecliptic, Aries is a zodiacal constellation, the smallest in scope of the twelve. Aries was a famous constellation to the ancients; 2,000 years ago the vernal equinox lay in this group. However, due to the precession of the equinoxes this point has shifted westward and now lies in the constellation Pisces. [A fact that many astrologers fail to consider in their predictions. -ed]

**DOUBLE STARS**

	Mag.	Sep'n (s)	Location	Remarks
γ	4.8-4.8	8	015119	White-Pale Grey
λ	4.8-7.6	38	015523	White- Blue
π	4.9-8.4-10.5	3-25	024717	Triple.
1	6.2-7.6	3	014722	
30	6.6-7.4	28	023424	Yellow-Grey; beautiful.
33	5.4-9.0	29	023727	Topaz-Sapphire; fine contrast.

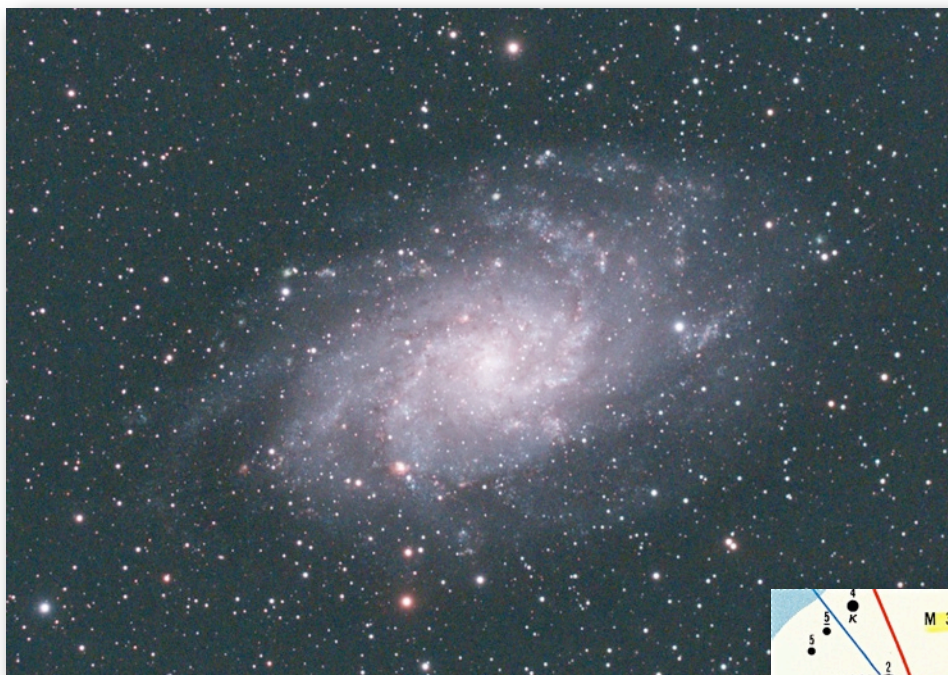


Image of M33 by Frank Williams Taken from Allenford over 3 nights Oct 2, 8, 9, 2013 Total of 133 images 180 seconds each approx 6-1/2 hours, through an 85 mm Televue APO scope Camera Canon T2i DSLR with a CCD-CLS filter. Stacked in Pix-insight software.

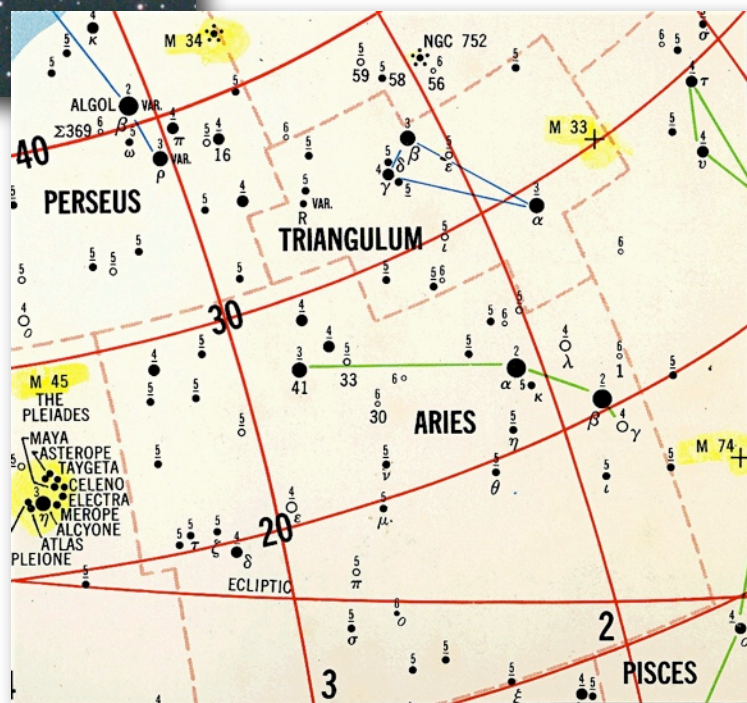
M33, the Triangulum Galaxy, is a perennial favorite of amateur and professional astronomers alike, due to its orientation and relative proximity to us. It is the second nearest spiral galaxy to our Milky Way (after M31, the Andromeda Galaxy) and a prominent member of the "local group" of galaxies. From our Milky Way perspective, M33's stellar disk appears at moderate inclination, allowing us to see its internal structure clearly, whereas M31 is oriented nearly edge-on.

Observations of M33 allow astronomers to compare the population of young, massive stars with other components of the galaxy, such as interstellar dust and gas, on the scale of individual giant molecular clouds. The clouds contain the raw material from which stars form. This presents direct insight into the star formation process as it occurs throughout an entire spiral galaxy and constitutes a unique resource for broader studies of galaxy evolution. [source: NASA/JPL]

The Location column in the tables above gives the RA (1st 4 digits) and Dec (2 last digits, bold=-negative) for the object. For ex. 1627**26** means 16 h 27 min RA and **minus 26** degrees Dec.

**Chart Legend**

- Star Location
- Double Stars
- + Nebulae
- ★ Clusters
- Variable Stars
- Var



Date: (Time given on 24 h clock EST unless otherwise noted).

<b>Jan 02</b>	00:30	<b>LQ Moon</b> rises locally at 12:35 am EST
	06:53	Moon at Apogee: 404 279 km
	18:00	Earth at Perihelion: 0.98330 AU
	22:35	Spica 4.7°S of Moon
<b>03</b>	18:45	Mars 1.5°S of Moon
<b>04 03:00</b>		<b>Quadrantid Meteor Shower 120/h, 3am peak</b>
<b>06</b>	18:57	Venus 3.1°S of Moon
	23:57	Saturn 3.3°S of Moon
<b>07</b>	06:34	Venus 6.3°N of Antares
<b>09</b>	20:30	NM rises locally at 7:15 am
<b>14</b>	09:00	Mercury at Inferior Conjunction
	19:10	Moon at Perigee: 369619 km
<b>16</b>	18:26	FQ rises locally at 11:43 am
<b>19 21:16</b>		<b>Aldebaran 0.5°S of Moon, Occultation</b>
<b>23</b>	20:46	FM rises locally at 4:20 pm Jan 22
<b>26</b>	20:10	Regulus 2.5°N of Moon
<b>27</b>	20:14	Jupiter 1.4°N of Moon
<b>30</b>	04:10	Moon at Apogee: 404553 km
	06:35	Spica 5.0°S of Moon
<b>31</b>	22:28	LQ rises locally at 12:18 am

## BAS Astronomy Events

<b>Jan 1 Fri</b>	Happy New Year! Catalina and Arcturus separation 0.5 degrees.
<b>Jan 2 Sat</b>	LQ
<b>Jan 4 Mon</b>	Quadrantid Meteors 120/h peaking at 3:00 am.
<b>Jan 6 Wed</b>	<b>NO BAS meeting</b> tonight. Join us March 2, 2016 for our first regular 2016 meeting.
<b>Jan 9 Sat</b>	NM Venus - Saturn 20 min of arc apart in morning sky
<b>Jan 15 Fri</b>	Comet Catalina near Alkaid (eta-UMa). Catalina becomes circumpolar Jan 13
<b>Jan 16 Sat</b>	FQ
<b>Jan 19 Tue</b>	Aldebaran occultation Dispp: 9:12 pm, Reapp; 10:31 pm EST Gibbous Moon
<b>Jan 23 Sat</b>	FM
<b>Jan 31 Sat</b>	LQ

## Special Events

## More Meteors; Another Aldebaran Occultation

Clouds thoroughly obliterated any systematic viewing of the Geminids and we have no images to share except to point you to websites like [www.spaceweather.com](http://www.spaceweather.com) or Alan Dyer's website at [www.amazingssky.net](http://www.amazingssky.net). Do have a look at the last one, Alan has posted a spectacular composite of Geminid meteors he took in New Mexico.

Only one report of a probable Geminid was sent in from a local observer. Brett T. writes: *I saw one early Geminid on Friday morning [Dec 11] about 2 am...slow....dropped out of the sky about where we saw that one at Fox...this one was literally a falling star! I was just stepping outside and saw the meteor slowly descend like a flame...looked like a star fell from the sky."*

The Quadrantid meteors offer another opportunity to view 120 per hour (weather permitting). The radiant for this one is between the tail of the Big Dipper and the top of Bootes in a defunct constellation called Quadrans Muralis. The peak falls at 3 am on Monday Jan 4 morning so may be missed by many who have to go to work later that day. These meteors are medium speed, faster than Geminids but slower than Perseids. The shower peak is very narrow and last only a few hours so if it is clear Jan 3 evening into Jan 4 am, it is worth watching for the entire night if you can make the effort. More on pg.8.

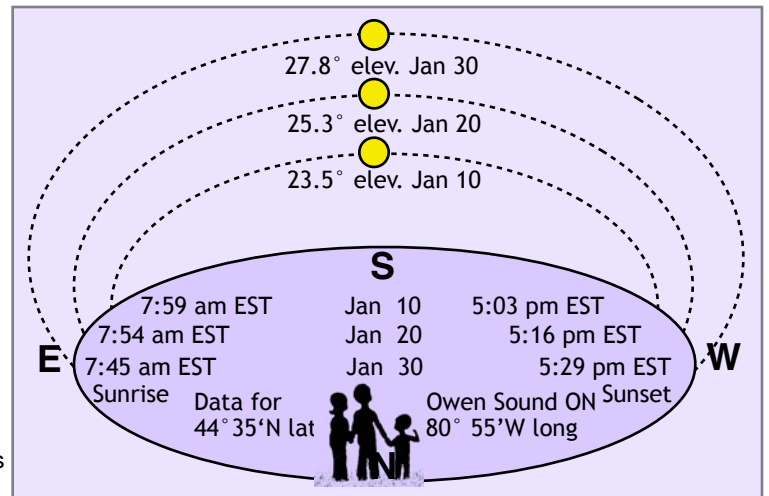
## Planets

**MERCURY** spends early January near the Sun and from Jan 20 to Feb 20, it joins Venus, Saturn, Mars and Jupiter in the morning sky.

**VENUS**, (-4.0) is a beautiful Morning Star and on Jan 9 makes a close pass at Saturn (less than 0.3° separation). The crescent Moon makes a nice group with Venus and Saturn on Jan 6 and 7. **MARS**, (mag. 1.1) is well placed in the morning sky between Jupiter and Venus/Saturn all month. **JUPITER**, (-2.2) rises by 9 pm by month end and is well up in the east at dawn. **SATURN**, (mag. 0.5) rises about 4 am by month end and passes very close to Venus Jan 9. **URANUS**, (5.8) and **NEPTUNE**, (7.9) are lowering in the evening sky in the west. Neptune sets around 8 pm and Uranus around midnight. **Dwarf planet, Ceres (8.3)** sets by 6 pm in mid Jan. **Asteroid, Vesta (6.7)** follows Ceres in the sky and sets around midnight. Both are generally in the same part of the sky as Uranus and Neptune. **PLUTO** (mag. 14) is not visible in January since it is too close to the Sun. Charts for these planets and asteroids are on the BAS website.

The diagram below gives the sunrise/sunset times and the Sun's altitude for December. The Sun passed solstice on Dec 21 and is now on its northward trek once again.

The moon phase graphic at the bottom of this page shows the lunar phase for each night of the month. Times of moonrise for NM, FQ, FM and LQ for Owen Sound are in the Sky Calendar listing at left. A good occultation of Aldebaran occurs Jan 19. See **Special Events**.



Jan 2016

## Aldebaran is occulted

in dark skies on Jan 19 mid-evening, not in the wee hours like last Nov. The Moon's phase is 3 days past FQ, Disappearance at 9:12 pm EST will occur on a dark limb. Reappearance is at the bright limb over an hour later 10:31 pm EST. The star is bright enough that, if skies are clear, both the D and R should be visible through even small telescopes. A tracking mount is a must unless you have a steady hand but use low power to keep the area in view.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

By permission  
Univ. of Texas  
McDonald Obs.

## BAS Member Loaner Scopes

### Solar H-alpha scope now available.

Our Lunt solar scope can be borrowed by BAS members and it is waiting at the Fox! Contact John to get your hands on it. We now have a suitable mount for it as well. A short training session will be provided on pickup.

### Several Dobbs available.

One 12-inch dobsonian loaner telescope is available for free loan by members. Smaller 8-inchers are also available. 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)

More than 1,000 billion photons of light strike the tip of a needle every second (unless it is tucked quite deep in a haystack).



Light Humour  
c/o Perimeter Institute

## Let There Be Light!



In celebration of the International Year of Light (2015), this series sponsored by the **Bluewater Association of Lifelong Learners** examines the science of light and the scientists who over the centuries have unlocked its secrets.

A key messenger informing our understanding of both the universe and subatomic world, light is also the basis of our most important sense - vision. Little wonder, then, that our world is a rich visual environment and that so many current technologies are optically based.

\*Note: All lectures incorporate demonstrations to illustrate the principles presented. Lasers are a part of these demonstrations.

**Bayshore Community Centre**  
Thursdays 10 am, Jan 7, 2016 to Feb 11, 2016  
Price: \$45.00 CAD

## FOR SALE:

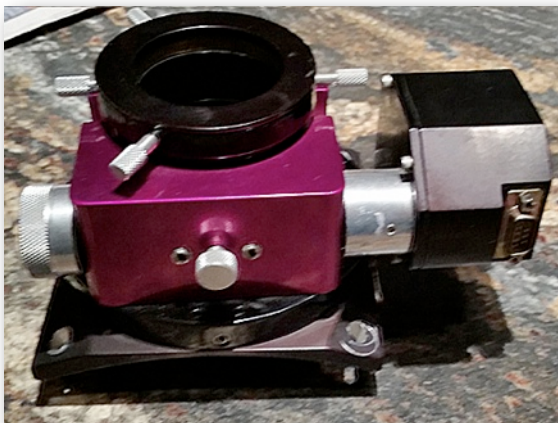
Moonlite CRL 2.5 inch Large Format **Crayford Newtonian Focuser** (\$592.10 new -see <https://focuser.com/products.php>) with Hi-Res Stepper Motor (\$252.81 new). Flange for 14" tube, accepts 2" accessories (EP/camera). This is a **true Crayford focuser**, not the cheap "Crayford-style" knock-off. Not set up for manual focusing, requires hand paddle (\$330 not included) for manual operation and computer control for remote focusing. This is meant for a remote imaging setup and comes from an abandoned project (12" scope). Over \$850 plus taxes and shipping new. Asking \$600.00. Contact **Paul Z.** at [ski@bmts.com](mailto:ski@bmts.com)

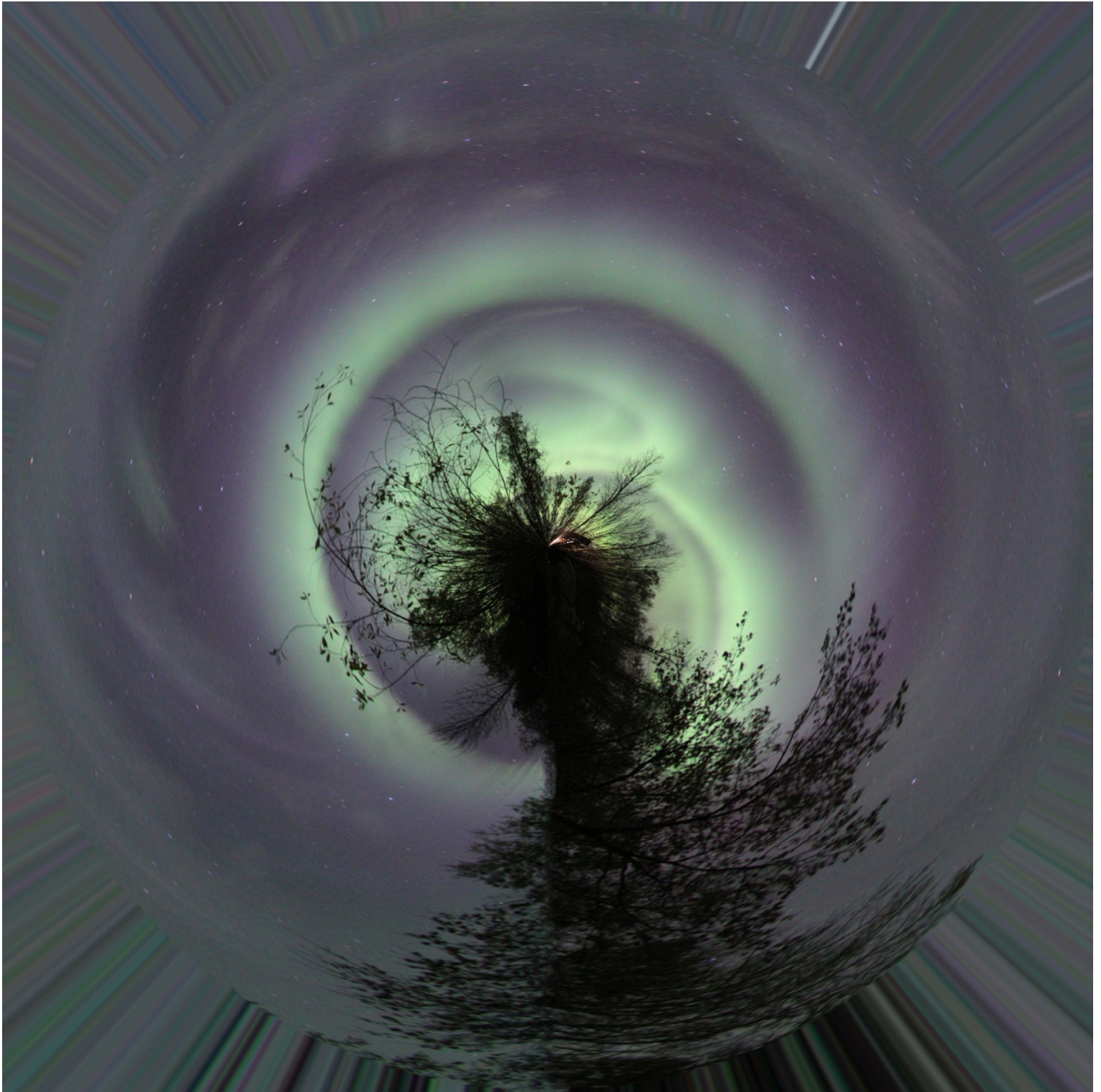
## FOR SALE:

**Celestron AVX mount.** Includes GOTO hand controller, tripod and two 10 pound counterweights. OTA capacity 30 pounds.

Reviews at <http://joebergeron.com/avx.htm>

New \$880, asking \$650.00.  
Contact **John H.** at [stargazerjohn@rogers.com](mailto:stargazerjohn@rogers.com)





## Aurora Borealis Tree

The “Aurora Borealis Tree” -a stereographic projection image of an aurora that appeared on Oct 8, 2012 in the skies near Edmonton, AB. The original image is shown at right and was taken by John H, using a Canon 50D, with a 10 mm wide angle lens at f/2.8, ISO 2000. Exposure was 6 s.

The creation of stereographic images is a relatively easy process and can be done in Photoshop manually (as was done for this image) or there are apps. These images are also referred to as “Little Planet” images which you can google for info. Here is one step-by-step guide using Photoshop: <http://www.photographymad.com/pages/view/little-planet-photos-5-simple-steps-to-making-panorama-worlds>

