



Astronomy News for Bluewater Stargazers
Vol 9 No.10 October 2015

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In spite of broken cloud cover in Bruce/Grey, the Sep 27 lunar eclipse was observed by many. The ES Fox group of a dozen or more, watched only the undersides of clouds and a live webcast from SLOOH, until reports of clear patches elsewhere caused us to scatter looking for breaks. Some were successful, others were not. See page 3 and 4 for images and reports from this group and others.



Image Above: Robert A. set up outside of London, ON and experienced the same disappointment due to cloud cover. After returning home, they were alerted to a clear break by a watchful offspring reporting a “coppery Moon”. Up went the equipment again and an image taken at 11:03 pm is shown here. ISO 1600 f/5.6 @ 2s FL=300mm

Hedy Lamarr (1914-2000)

Inventor and actress

To get secret messages past the Nazis, Hedy Lamarr co-invented a frequency-hopping technique that helped pave the way for today's wireless technologies. For years, her achievement was overshadowed by her other career, as a Hollywood star.



PI
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Perimeter Institute in Waterloo, ON, has issued a series of posters honouring Women in Physics. SGN 2015 issues will feature women who have made major contributions to astronomy and physics.

Lunar Eclipse Report (see also pages 3&4)



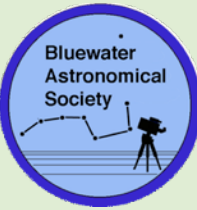
Image taken shortly after totality ended (and clouds parted) from Owen Sound at 11:28 pm. Canon 60Da on a TV 4-inch refractor at 864 mm effective focal length, a 0.5 s image at 2000 ISO.

While taking test images to gauge exposure, Chris Hlynialuk caught this aircraft silhouette by accident several minutes before first umbral contact. The very first trace of the Earth's shadow is barely detectable in the upper left corner where it darkens Oceanus Procellarum near the crater Aristarchus. Chris was using a classic orange-tube C-8 with a Canon 50D at prime focus. Photo taken from St. Paul, Minnesota. A complete set of Chris's images are on page 4 of this issue.



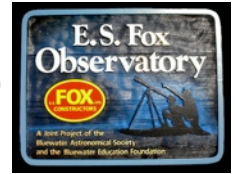
Image above: Chance alignment of jet and Moon at 8:51 pm CST a few minutes before first contact. C-8 at prime focus (2032 mm) Canon 50D, 1/1500 s exp. ISO 800

Disclaimer: S G N reports on the activities of the Bluewater Astronomical Society (formerly Bruce County Astronomical Society) but any opinions presented herein are not necessarily endorsed by BAS. See the BAS website at www.bluewaterastronomy.info for up-to-date details relating to BAS events. The BAS weblog is back, with articles of immediate interest written by various BAS members. SGN is produced and edited by John Hlynialuk. I am solely responsible for its content. Your original articles, images, opinions, comments, observing reports, etc., are welcome. I reserve the right to edit for brevity or clarity. Errors or omissions are entirely mine although I strive for accuracy in star events, etc. I will not publish your emails or other materials without your specific permission to do so. No part of this publication shall be reproduced in any form whatsoever without the editor's consent. However, the Sky Calendar and Feature Constellation pages are free to copy. Feel free to forward this issue in its entirety to friends. Email comments and/or submissions to stargazerjohn@rogers.com

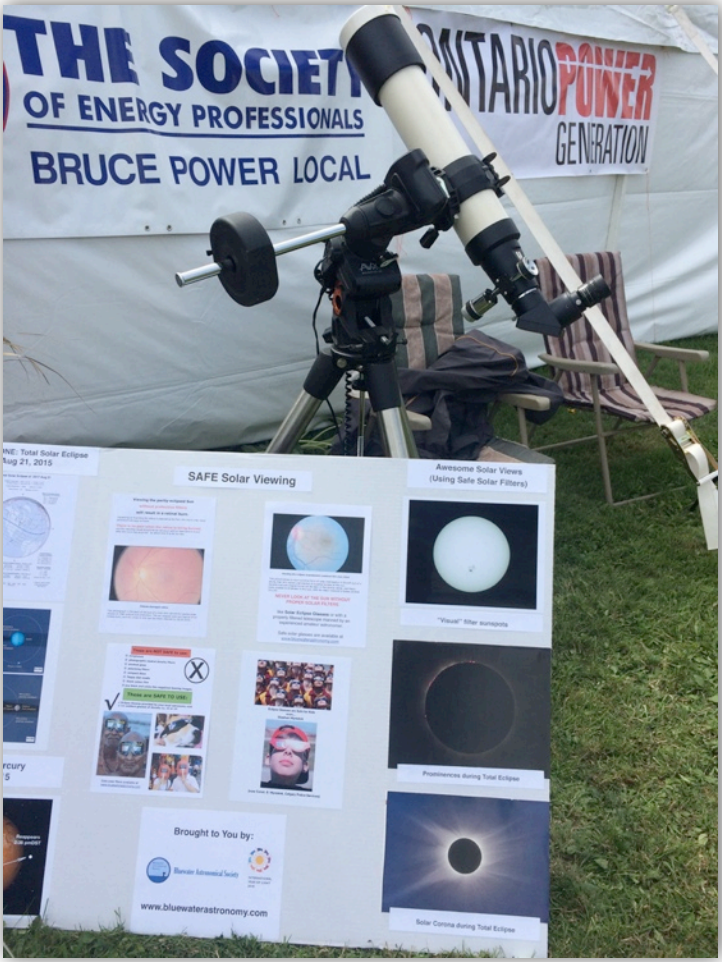


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BAS takes in Paisley Fall Fair and more...



BAS members took their solar scopes to the Paisley Fall Fair and to the Meaford Hall in September to show off sunspots and prominences on the Sun. The skies cooperated with partly sunny (Paisley) and spectacularly sunny (Meaford) weather. The Paisley event (John H. and Cheryl D. see image right) was at the education tent sponsored by the great folks at the nuclear site. The Meaford event was under the auspices of the Arts and Cultural Centre. If you haven't seen the interior of the renovated Meaford Hall, it is spectacular with spaces for concerts and art shows.. "Solartalk" (John H.) was the first of the Speaker Series and BAS had the honour of kicking the season off. Check the programs at www.meafordhall.ca. There is some impressive entertainment this season!

BAS & Astronomy Events for October

- Oct 2 Fri** **Aldebaran Occultation** Disappearance at 9:53 am EDT, reappearance at 10:53 am EDT (daytime) for Bruce-Grey. Moon near Last Quarter
- Oct 4 Sun** LQ
- Oct 7 Wed** BAS meets at Grey Roots Museum. Steve Briggs (opt.)
- Oct 8 Thu** **Venus only 0.7° from Last Crescent Moon**
- Oct 9 Fri** **Last Crescent Moon, Mars, Jupiter in a 5° triangle. Mercury close to horizon. Nice!**
- Oct 10 Sat** BAS viewing@Fox
- Oct 12 Mon** **NM and Uranus at opposition**
- Oct 20 Tue** FQ
- Oct 21 Wed** **Orionid meteors: 20/h peak at 7 pm** Moon is 61% illuminated (just Past FQ)
- Oct 23 Fri** BWDSB trustees tour of ES Fox Observatory
- Oct 26 Mon** **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 on Oct 26. Venus-Jupiter separation just over 1° Oct 25, Venus-Mars separation 0.7° Nov 3.
- Oct 27 Tue** FM



A couple of sunflowers mug for the camera. There is always fun to be had at our region's fall fairs. And you can't go wrong with all the goodies available at the food booths! UMMM....donuts....yum!



Left: Aaron T. took this image about 20 minutes before totality (Location: secret, Image data: secret).

Above: Notice that our area is in the "poor" section!



Left: Some of the visitors hoping to catch a sight of the eclipsed Moon from the Fox Observatory on Sunday night. Living up to its reputation as the most boring event in astronomy, the eclipse has put one participant to sleep, another is visibly bored, and a third is checking messages. Even Dr. Albert is sleeping behind his sunglasses.

HOWEVER, the email reports continue to come in. I received reports from Massie (with cell phone images), somewhere on the road near Tara/Chesley/Allenford, Mennonite Corners, and an unknown (secret?) location where Aaron T. was located. Also Port Elgin, Big Bay, London ON, and St. Paul MN where my son Chris caught a neat flypast near the start of the eclipse. See page 1 and page 4.



From David Leggatt: (the guy in the Tilley hat at the back?)

I was out to see the super moon last night. The presentation while we waited for the clouds was great. Please thank the lady who told us it was clear over Tara. My friend and I drove down and parked on a side road just north of Tara. It was still completely overcast but gradually the cloud moved off and around 11:00 we got to see the moon. Sorry we missed the red part but what we saw was still amazing. As my friend said 2 seventy + year olds parking on a back country road, what a hoot.

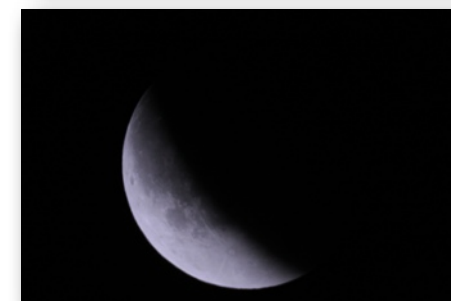
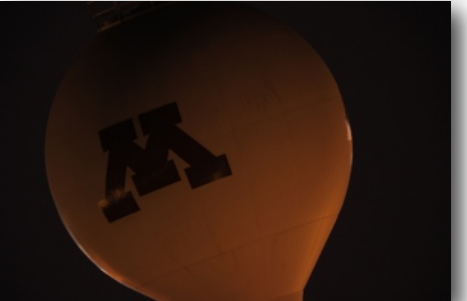
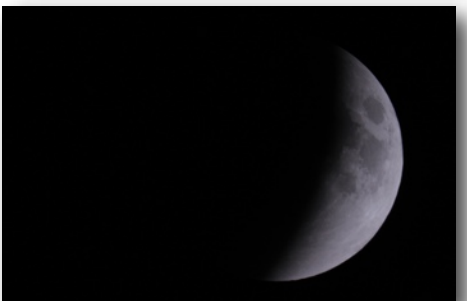
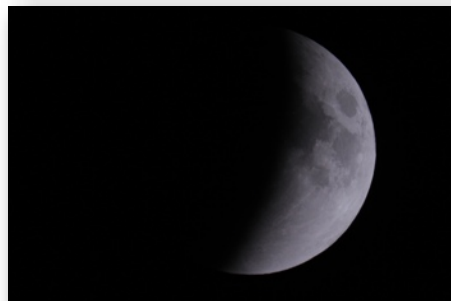
Richard Porter took this image at 10:22 pm just 25 minutes before mid-totality through an 80mm AstroTech ED refractor. ISO 200, exp. for 6 s, using a Canon 350D.

Frank Williams put a few hundred km on his car hunting for a clear break. He reports: *Clouded out, chased clouds and did see it between clouds between Tara and Chesley no pix though. I tried Hepworth, Owen Sound, then Tara, but quickly clouded over there too, saw blood red moon north of Chesley again though through clouds, lots of miles!*

Zoe Kessler reported: We drove around for over an hour chasing clear sky and finally hit paydirt. It was fantastic. Frank saw it in Tara. A bunch of us split up after all that driving and Karly (MacDonald) watched it just outside Chatsworth and Dave, Glen and I finally found it in clear sky at Mennonite Corners as we were heading to Tara.



Image above was taken at 11:50 pm with the Moon well out of totality but not out of the cloud cover. Clouds plagued the view until solid overcast came back a few minutes after midnight and before the last contact of the umbral shadow heralding the end of the eclipse. Image by John H. ISO 2000 f/5.4, 0.10 s, 864 mm (effective fl) at prime focus of TV NP 101 refractor.



The changes of eclipse light levels is recorded beautifully here in 17 images taken by Chris Hlynialuk through a C-8 at prime focus. Chris observed the eclipse from St. Paul, Minnesota where he works as a researcher at the Grossman Centre of Memory Research at the University of Minnesota (obviously from the big "M" in image 9). He says #9 was a focus test shot, but it looks like gratuitous advertising to me.

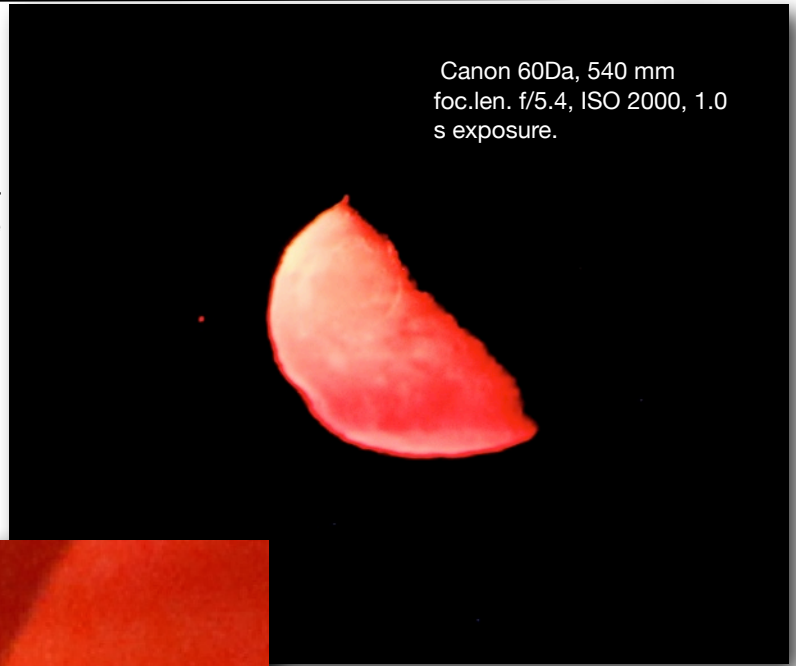
The early morning Sep 5 Aldebaran occultation was successfully observed by two determined BAS members observing from the Kemble Lookout on Grey Rd 1. Anton V. and John H. set up with refractors and binoculars at 11 pm in plenty of time to see the event.

At first, the clouds hid the NE horizon (Sag and Sco in the MW were visible in the south) but the prevailing winds were carrying the thicker clouds away from the critical point where the moon would rise by the predicted moonrise time (11:51 pm Sep 4). Anton spotted the top of the Moon first and John very quickly zeroed in with the refractor and snapped an image. To our astonishment, Aldebaran was visible as a red dot near the top limb of the Moon which could not have been more than half a degree above the physical horizon. John kept snapping away and was able to bracket the disappearance at the bright edge as sometime in the 8 seconds between 12:06:54 am and 12:07:02 am. It was not visible to the eye (clouds got in the way) but under close examination of the individual camera frames there was a faint image present on several critical frames around that time.

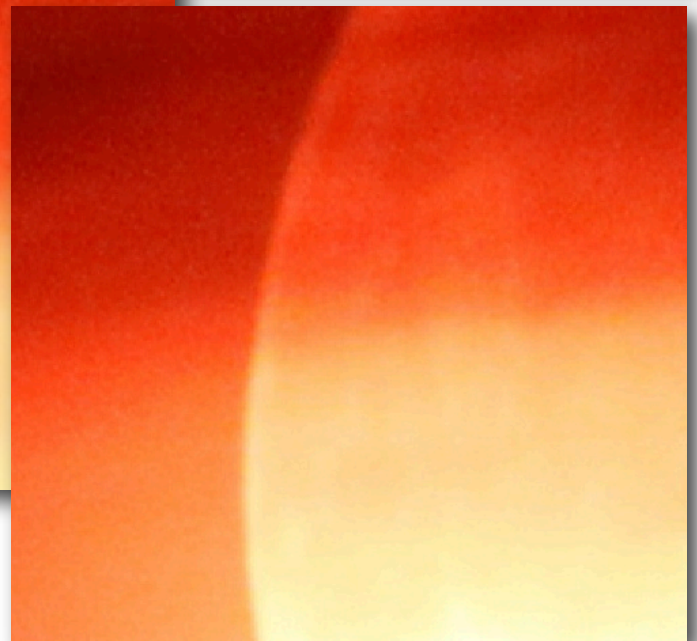
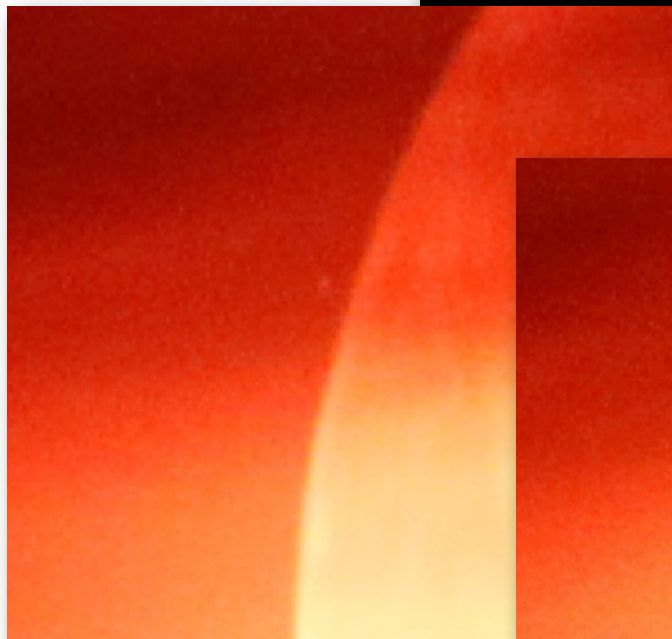
During the entire event, some clouds were interfering with the clarity of the sky, but the reappearance at the bright limb occurred in relatively clear sky. It was seen by both (very pleasantly surprised) viewers, Anton through a 3-inch 500 mm fl. Skywatcher refractor (at 12.5X) and John through the viewfinder of the camera mounted on the TV NP101 as the camera clicked away. Reappearance time was 12:40:44 am

By that point, the Moon and Aldebaran were in relatively clear sky as seen in this image below taken more than 8 minutes later at 12:48:29 am.

Both of us were able to see Aldebaran with the naked eye a few minutes after the reappearance. We watched it gradually move farther and farther away from the dark limb as we made our way home completely satisfied at having observing a rare event. Chalk up one more item on the life list of astronomy sights!



Canon 60Da, 540 mm
foc.len. f/5.4, ISO 2000, 1.0
s exposure.



Images above were made at 12:06:54 am (left) and 12:07:02 am (right) with an interval of only 8 seconds. Clearly Aldebaran is visible on the left image but not the right. Canon 60Da, 540 mm foc.len. f/5.4, ISO 2000, 4 s exp. Cropped and enlarged.

Aldebaran undergoes an unprecedented series of monthly occultations from 2015 to Sep 2018. The next one is Oct 2 but it is a daylight event lasting from disappearance at the Moon's bright limb at 9:53 am DST to reappearance at the dark limb at 10:53 am. Another on Nov 26 happens during dark hours but the Moon is full and the events may be difficult to see. Disappearance is at 5:40 am EST, reappearance at 6:28 am EST. Finally the last occultation for 2015 is on Dec 23 but is not visible west of the central Atlantic Ocean.

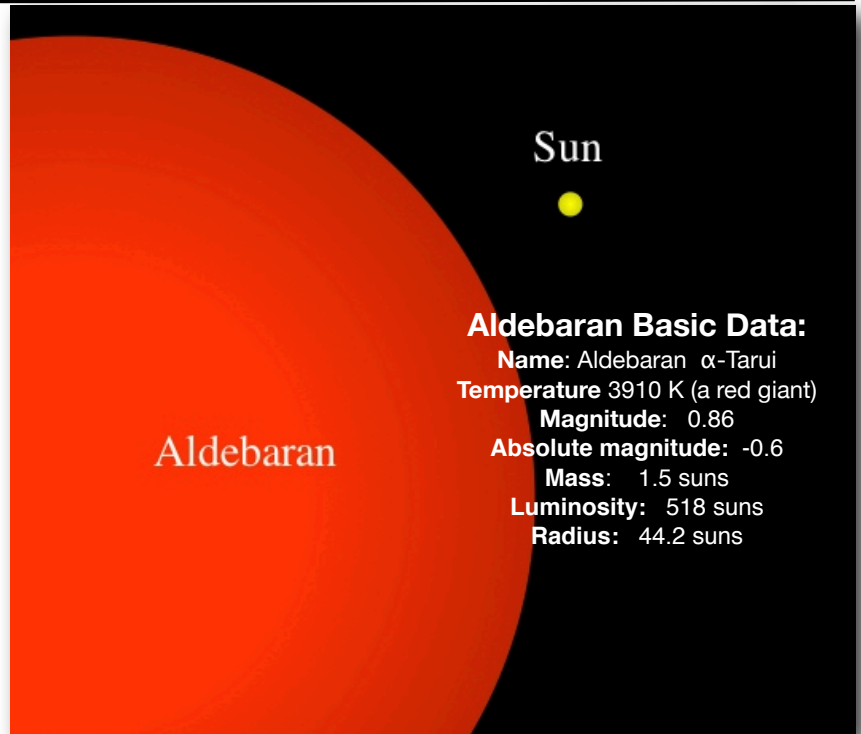
In 2016, the series of an occultation continues every month until Sep 2, 2018, that's **36 more Aldebaran occultations** starting with the Oct 2, 2015 event! There are plenty more chances to see Aldebaran blink out behind the Moon!

Image left: Aldebaran well away from the dark lunar limb at 12:48 am, Canon 60Da, 540 mm TV NP101. f/5.4, ISO 2000, 1/32 s exposure. All images this page by John H.

Aldebaran is an interesting star in its own right. A red giant star, over 40 times larger than the Sun, it sits in front of the Hyades Cluster in the face of Taurus, the Bull. It lies 65 light years away while the cluster is almost 3 times farther at 153 light years. A chance alignment has put Aldebaran into place off the end of one of the sides of the V we recognize in general as Taurus the Bull.

Alpha-Tauri also has a distinction because of its placement along the path the Moon traverses in the sky. Luna deviates noticeably from the ecliptic and she can be found as much as 5 degrees north or the same amount south of the apparent path followed by the Sun. [The most recent dates when the Moon was this far was 2006 and the next one will be 2025.]

Aldebaran is one of only a few 1st magnitude stars that are close to the ecliptic (Spica, Antares and Regulus are the others) and it, like the others, can be occulted by the Moon on a regular basis. This year, Aldebaran has an unprecedented series of over a dozen occultations by the Moon. True, not all are visible when Aldebaran is in our night sky but here in S.Ontario we get at least two or three opportunities to view an Aldebaran occultation.



Measuring Sizes of Stars

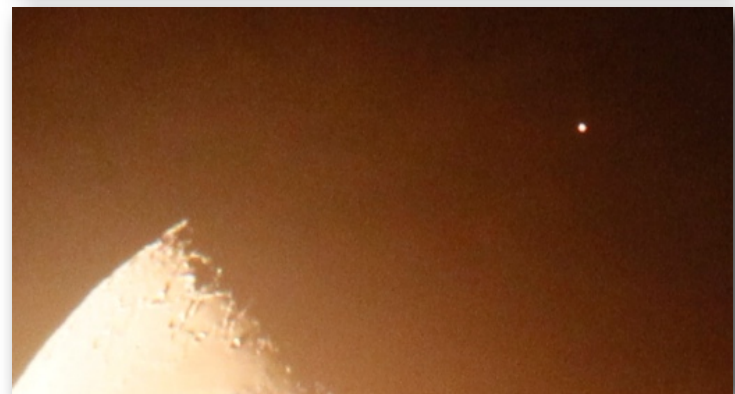
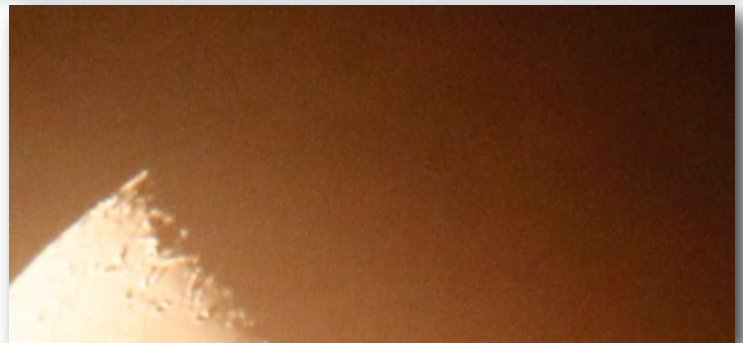
One of the most important dimensions of stars is their radius. Only one star, Betelgeuse, is large enough to have its size measured directly -all the others are too distant and small for such a measurement. So, astronomers use other techniques, some more complicated than others. As for Aldebaran, it has the unique status of being the most measured star by the technique of lunar occultation. We just wait for it to pass behind the Moon and as the limb passes in front of the star, the light dims gradually rather than abruptly. The rate of dimming is a measure of the diameter.

It is never of course as simple as it sounds, because surface features and the slope of the Moon affect the rate. So does scintillation in our atmosphere and even the possibility that the star may be oval-shaped due to rapid spin. It may also have big sunspots or be in a very close binary star relationship.

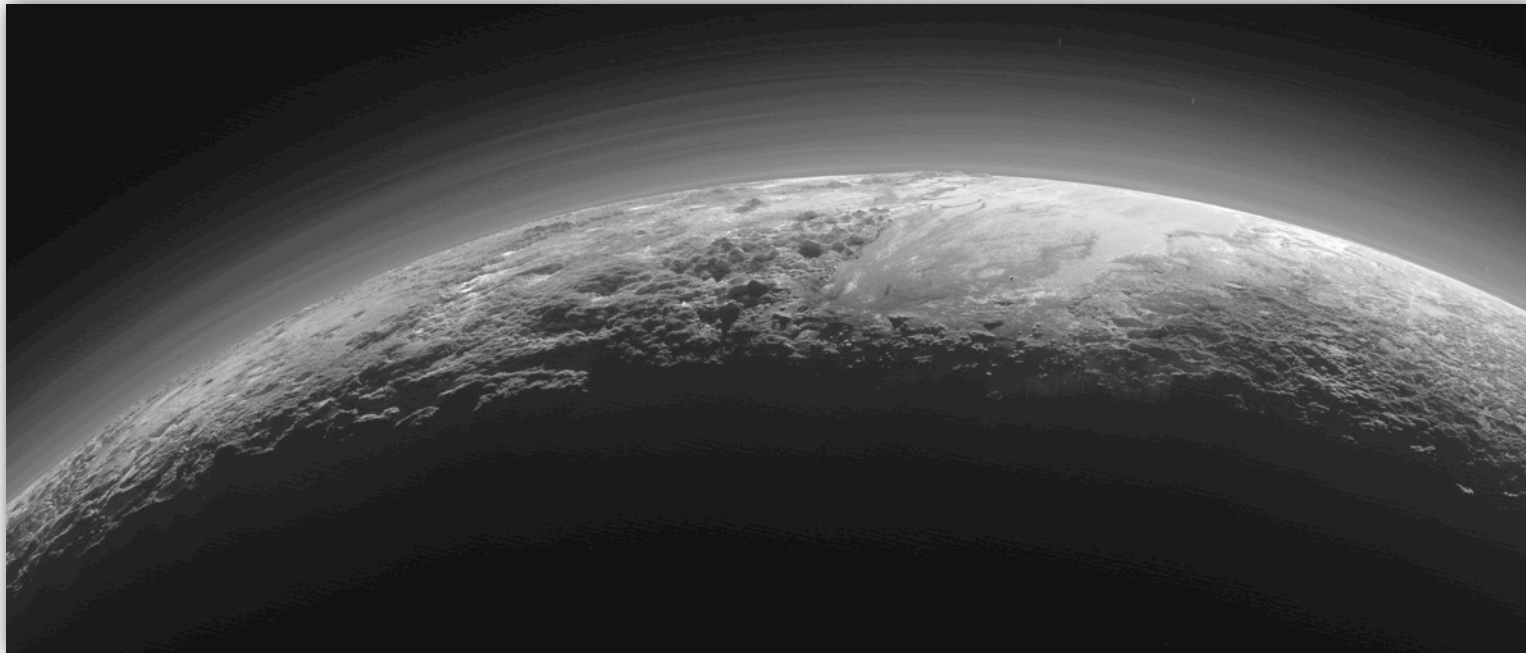
Still, the size of Aldebaran has been measured at least 46 times by the method of lunar occultation alone and its radius is known to a fair degree of accuracy. Currently the accepted value is 44.2 times the solar radius or 30 741 100 km. (for diameter, double this number!) The diagram in the upper right shows the relative sizes quite nicely.

And now to the crunch of the current observations. On other occasions, observers watching Aldebaran occultations visually have noted a gradual rather than abrupt change in Aldebaran's light when blocked by the limb. So the exposures of the reappearance on Sep 5 were purposely set to be short (1 s) to try to catch this. The images show that the attempt was entirely successful!

The set of three identically exposed images at right show the gradual increase in light output as Aldebaran appeared from behind the Moon's dark limb. The shots were made at 12:40:43 (no star) 12:40:44 and 12:40:45 with Aldebaran at its normal brightness. Aldebaran can take a few tenths of a second to appear or disappear depending on the slope of the Moon's surface at the occultation point. This is enough to be seen by visual means. The camera by sheer luck caught a "partial phase" in the middle frame. Canon 60Da, 540 mm foc.len. f/5.4, ISO 2000, 1.0 s exposures. Cropped and enlarged.



Hi-res Pluto Images Start Coming In

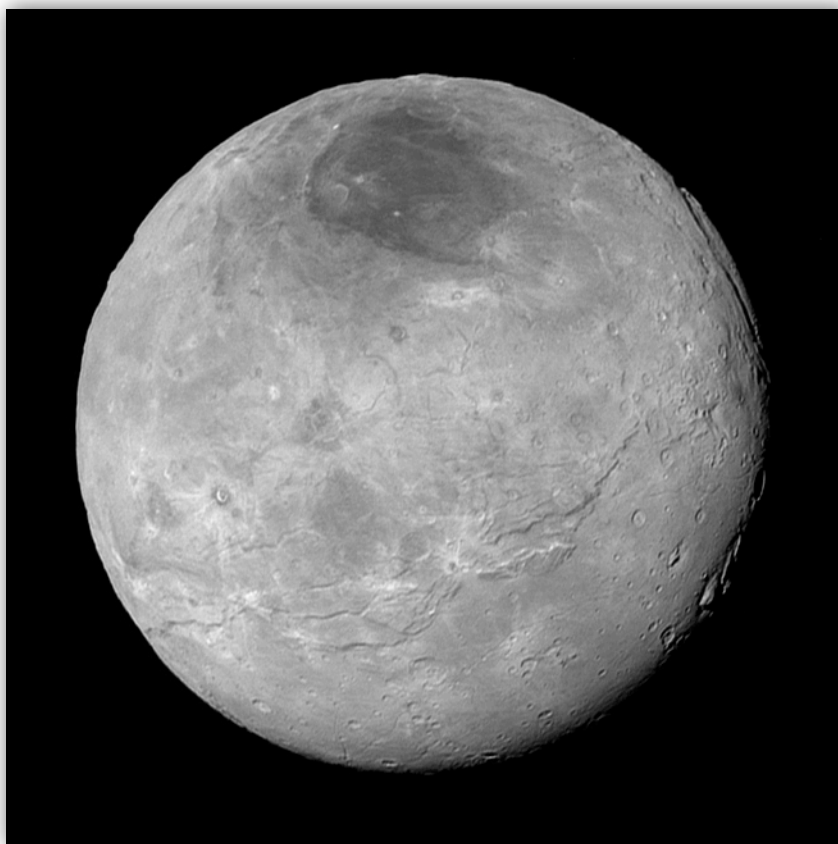


The first hi-res Pluto images are starting to come in from New Horizons and, as expected, they are spectacular! The image above comes in a large file that has incredible details. Click on the link provided here: http://i0.wp.com/www.nasa.gov/sites/default/files/thumbnails/image/nh-apluto-wide-9-17-15-final_0.png and have a good look at the mountains and ice-fields of this most interesting dwarf planet. Charon images also show a lot more detail. The full release is available here: and can be accessed at the New Horizons site: https://www.nasa.gov/mission_pages/newhorizons/main/index.html

Image above: Only 15 minutes after its closest approach to Pluto on July 14, 2015, NASA's New Horizons spacecraft looked back toward the sun and captured this near-sunset view of the rugged, icy mountains and flat ice plains extending to Pluto's horizon. The smooth expanse of the informally named icy plain Sputnik Planum (right) is flanked on the left by rugged mountains up to 11,000 feet (3,500 meters) high, including the informally named Norgay Montes in the foreground and Hillary Montes on the skyline. To the right, east of Sputnik, rougher terrain is cut by apparent glaciers. The backlighting highlights over a dozen layers of haze in Pluto's tenuous but distended atmosphere. The image was taken from a distance of 11,000 miles (18,000 km). Be sure to click for a large version to better see the details described. **Credits: NASA/JHUAPL/SwRI**

This image of Pluto's largest moon Charon, taken by NASA's New Horizons spacecraft 10 hours before its closest approach to Pluto on July 14, 2015 from a distance of 290,000 miles (470,000 kilometers), is a recently downlinked, much higher quality version of a Charon image released on July 15. Charon, which is 750 miles (1,200 kilometers) in diameter, displays a surprisingly complex geological history, including tectonic fracturing; relatively smooth, fractured plains in the lower right; several enigmatic mountains surrounded by sunken terrain features on the right side; and heavily cratered regions in the center and upper left portion of the disk. There are also complex reflectivity patterns on Charon's surface, including bright and dark crater rays, and the conspicuous dark north polar region at the top of the image. The smallest visible features are 2.9 miles 4.6 kilometers) in size.

Credits: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute



Are Ceres Bright Spots from 'Water Leakage'?

From Universe Today by Ken Kremer

The question on everyone's mind about Ceres is what the heck are those bizarre bright spots discovered by NASA's Dawn orbiter?

Since scientists believe that Ceres occupies a "unique niche" in the solar system and apparently harbors subsurface ice or liquid oceans, could the bright spots arise from subsurface "water leakage?" To find out Universe Today asked Dawn's Principal Investigator and Chief Engineer Prof. Chris Russell.

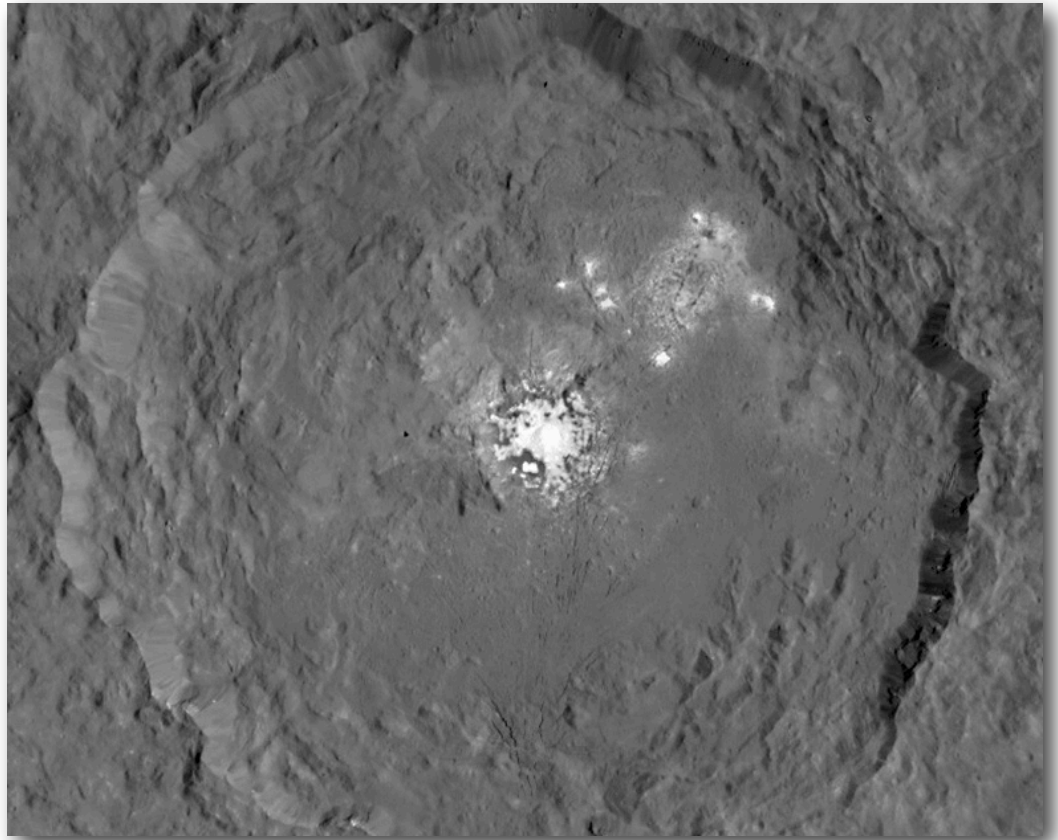
"The big picture that is emerging is that Ceres fills a unique niche between the cold icy bodies of the outer solar system, with their rock hard icy surfaces, and the water planets Mars and Earth that can support ice and water on their surfaces," said Russell, of the University of California, Los Angeles. And with Dawn recently arrived at its second lowest science mapping orbit of the planned mission around icy dwarf planet Ceres in mid-August, the NASA spacecraft is capturing the most stunningly detailed images yet of those ever intriguing bright spots located inside Occator crater.

The imagery and other science data may point to evaporation of salty water as the source of the bright spots. "Occasional water leakage on to the surface could leave salt there as the water would sublime," Russell told me. Dawn is Earth's first probe to explore any dwarf planet and the first to explore Ceres up close. It was built by Orbital ATK.

The new imagery from Dawn's current HAMO mapping orbit was taken at an altitude of just 1,470 kilometers. They provide about three times better resolution than the images captured from its previous orbit in June, and nearly 10 times better than in the spacecraft's initial orbit at Ceres in April and May, says the team.

So what are the bright spots? Initially a lot of speculation focused on water ice. But the scientists opinions have changed substantially as the data pours in. "When the spots appeared at first to have an albedo approaching 100%, we were forced to think about the possibility of [water] ice being on the surface," Russell explained. "However the survey data revealed that the bright spots were only reflecting about 50% of the incoming light." "We did not like the ice hypothesis because ice sublimates under the conditions on Ceres surface. So we were quite relieved by the lower albedo."

"So what could be 50% reflective? If we look at Earth we find that when water evaporates on the desert it leaves salt which is reflective. We know from its density that water or ice is inside Ceres." "So the occasional water leakage on to the surface could leave salt there as the water would sublime even faster than ice." At this time no one knows how deep the potential ice deposit or water reservoir sources of the "water leakage" reside beneath the surface,



or whether the bright salt spots arose from past or current activity. This image, made using images taken by NASA's Dawn spacecraft during the mission's High Altitude Mapping Orbit (HAMO) phase, shows Occator crater on Ceres, home to a collection of intriguing bright spots. **Credits: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA**

and perhaps get replenished or enlarged over time. To date there is no evidence showing plumes currently erupting from the Cerean surface.

But much work remains to gather and interpret the data and discern the identity of which salts are actually present on Ceres.

"While salts of various sorts have the right reflectance, they are hard to distinguish from one another in the visible," Russell elaborated to Universe Today. "That is one reason VIR is working extra hard on the IR spectrum. Scientists are beginning to speculate on the salts. And to think about what salts could be formed in the interior." "That is at an early stage right now," Russell stated. "I know of nothing exactly like these spots anywhere. We are excited about these scientific surprises!"

Dawn remains at HAMO until October 23. Then it begins thrusting with the ion propulsion thrusters to reach its lowest mapping orbit named LAMO [Low Altitude Mapping Orbit] and will arrive at LAMO on December 15, 2015. That's a Christmas present we can all look forward to with glee!

[The original story is available in its entirety here:

<http://www.universetoday.com/122286/do-ceres-bizarre-bright-spots-seen-in-dazzling-new-close-ups-arise-from-water-leakage-dawn-science-team-talks-to-ut/>

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STARMUS: 50 Years of Man in Space

“Never before have such an ambitious series of talks, articles, and recollections been assembled to celebrate the human exploration of Space. It is the result of the unique STARMUS meeting in 2011 on Tenerife, in the Canary Islands where the Russian and American pioneers of the Space Age met up for the first time to share moments that electrified the Human race.”

Garik Israelian, Brian May, and David Eicher
Editors and Organizers of STARMUS 2011

Last night was a sparkling moonlit night and my wife, Paula, and I were observing from our Four Elements Observatory at Little Pine Tree Harbour. We were paying attention to the 10 day old waxing gibbous Moon. For my part, I was experimenting with various camera settings to use during this Sunday’s (September 27th) total Lunar eclipse. Paula was pushing the limits of her Celestron CPC 9.25 inch SCT. She is an excellent observer and was counting craters on the floor of Clavius, a spectacular, 4 billion year old crater (actually a 245 km walled plain), located in the Southern Lunar Highlands, just south of the rayed crater, Tycho. On this night she counted 39 craters while I could only tally 36 craters. I speculated “ *maybe by the time I arrived at her scope the seeing could have deteriorated* [☒]”. The Moon provides the most telescopic detail of any celestial object and is the easiest object to see but presents a complex observing vista. I never tire of the telescopic view.

After we had finished observing Paula returned to our cottage. I walked out onto our dock and sat in the moonlight, just quietly enjoying the reflected moonlight on the water’s surface. Do you ever think how certain pivotal experiences can affect the direction of your life’s journey? I can recall hundreds of specific examples from my own life. Standing on the dock on this night, I briefly thought back to two experiences that shaped Paula’s and my journey in astronomy. As a couple, our fascination with the night sky can be traced back to a starry August night, in 1969, on Prince Edward Island, where the stars seemed close enough to touch. Since then, our astronomy journey has taken us to 6 continents, visits to the world’s major research observatories, and provided observing experiences with friends from around the world. However, my own interest in science goes back even further, to Monday, October 7th, 1957. Three days previously, on Friday, October 4th, the Russians launched “Sputnik”, the first artificial Earth Satellite. Now, 3 days later on Monday, as a grade 7 student in St John’s, Nfld, I was waiting for my bus beside a corner convenience store. In the store’s window was the front page of the local newspaper with the headlines, in big, bold type, heralding the Oct 4th Russian achievement by proclaiming “Another Moon in our Sky”. I was fascinated and my 58 year scientific journey began!

Over the next few years the Russian space program produced many firsts, culminating, on April 12th, 1961, with Yuri Gagarin’s single orbit of the Earth in his Vostok spacecraft. Of course, the Americans later caught up, and then surpassed the Russians, when Neil Armstrong and Buzz Aldrin landed at the Sea of Tranquility on July 20th, 1969. I certainly remember where I was on that night ! Paula and I were visiting my Uncle Bruce and his family in St. John’s Nfld, and we watched the entire spectacle of grainy TV images from their living room.

But, Yuri Gagarin was the first to venture into space and the 50th anniversary of Gagarin’s flight would arrive in 2011. Astrophysicist, Brian May (who was a guitarist with the rock group Queen, before



he earned his PhD in astrophysics), and astrophysicist, Garik Israelian, (who was Brian May’s thesis advisor), decided to organize a 2011 science/music festival, which they called called STARMUS (stars and music) to commemorate Gagarin’s flight and celebrate 50 years of Man in Space. The festival activities were held between June 20th and June 25th at both Tenerife and La Palma in the Canary Islands. Organizers described the guest speakers as representative of



Brian May and Garik Israelian organizers of STARMUS

the greatest minds in space exploration, astronomy, cosmology, planetary science, and astrobiology. The fascinating speakers included:

- Neil Armstrong** (*Future of Earth*),
- Jim Lovell** (*Houston, We Have a Problem*),
- Yuri Baturin** (*The Astronaut’s Earthly Mission*),
- Claude Nicollier** (*Revisiting Hubble*),
- Michael Mayor** (*Extrasolar Planets in the Galaxy*),
- Jack Szostak** (*Origin of Life on Earth*),
- Jill Tartar** (*Is Anybody Out There?*),
- Richard Dawkins** (*Evolution and Exobiology*),
- Kip Thorne** (*The Most Luminous Objects in the Universe*),
- Robert Williams** (*Five Breakthrough Discoveries*),
- Leslie Sage** (*How Astronomy Changed What it Means to be Human*), and
- Sam Solanki** (*Is the Sun to Blame for Global Warming?*).

The purpose of the festival's speakers was to take stock of what has been accomplished during the first half century of the Space Age. The primary festival site, where the main lecture presentations were held, was the Ritz Carlton Hotel in Tenerife. There was a secondary site, on La Palma, beside the largest optical telescope in the world, the 10.4 m Gran Telescopio Canarias, where a round table discussion of STARMUS speakers was held.

Following the conclusion of the 2011 STARMUS festival, David Eicher, Editor in Chief of Astronomy magazine, reflected that:



STARMUS Round Table Discussion Beside the 10.4 m Gran Telescopio Canarias

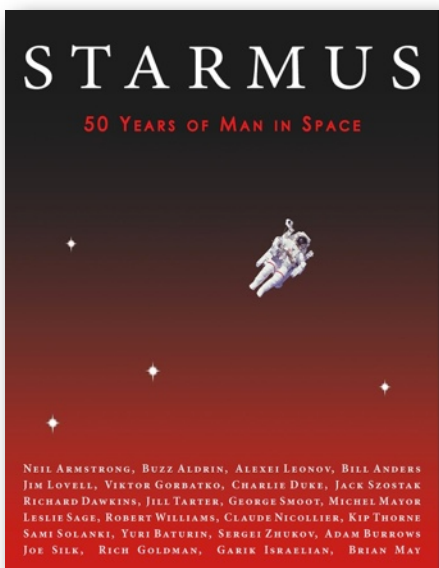
“... never before had time and space brought together such a crowd of explorers. This event not only featured a stellar array of talks, but also a visit to the largest optical telescope in the world, astrophotography displays, a star part ,a space art exhibition, and a rock concert featuring Brian May, and the Tangerine Dream.”

Eicher then decided that a book of material, derived from the talks given at the 2011 SARMUS festival, would provide a unique resource for those interested in Space and Astronomy. He enlisted Garik Israelian and Brian May to act as Editors in Chief, and convinced Stephen Hawking to write the Foreword. The end result is a most fascinating book ... “STARMUS – 50 Years of Man in Space” published in 2014 by Canopus Publishing. (in Canada, Shelter Harbour Press) ISBN 978-1-62795-026-8)

Two weeks ago, I came across a number of copies at Indigo (Chapters), in London, Ontario and bought my own copy. I must say that I dropped all my other reading and have now read, with fascination, the book from cover to cover. I highly recommend it! It should cost about \$40 CDN and you may also be able to get it from Amazon.ca.

Just a final note, -the 2016 STARMUS Festival (the third one) will be organized by the Royal Astronomical Society and again, will be hosted at Tenerife on the Canary Islands, from June 27th to July 2nd, 2016. The festival will pay tribute to Stephen Hawking and will attract the greatest minds in Science and Space. What are you doing in late June, 2016?

STARMUS: copies available from Amazon.ca



Review from Amazon.ca:

Never before has such an ambitious series of talks, articles, and recollections been assembled to celebrate the human exploration of space. It is the result of the unique Starmus meeting in 2011 on Tenerife, where the legendary Russian and American pioneers of the space age met up for the first time to share the moments that electrified the human race. Neil Armstrong, Buzz Aldrin, Bill Anders, Yuri Baturin, Charlie Duke, Victor Gorbatko, Alexei Leonov, Jim Lovell, Claude Nicollier, and Sergei Zhukov tell their personal stories about the first space walk, the lunar landing, the heroic recovery of Apollo 13, the repair of the Hubble Space Telescope, and much more.

Our discovery of the Universe, our place within it, and the meaning of life on Earth also forged dramatic moments at Starmus through the presentations of some of the world's leading scientists and thinkers such as Rich Goldman, Brian May, Jack Szostak, Richard Dawkins, Jill Tarter, Joseph Silk, George Smoot, Michel Mayor, Robert Williams, Adam Burrows, Garik Israelian, Kip Thorne, Sami Solanki and Leslie Sage.



This volume was originally conceived to mark 50 years since Yuri Gagarin's first spaceflight, but is now equally dedicated to one of our greatest heroes in human history -- Neil Armstrong, who passed away in 2012.

With an introduction by renowned theoretical physicist Stephen Hawking, **Starmus: 50 Years of Man in Space** celebrates the critical human moment we have lived -- the first steps into outer space, the explosion of knowledge about our cosmos, and where it might all be taking us. It will become one of the seminal books of our era.

Fact: On ten occasions during the 4-day interval of Sep 9 to 12, the planetary K-index (a measure of atmospheric disturbance) reached a value of 6 out of a maximum 9.

Fact: In the week of Sep 6 to 12, I received almost 2 dozen alerts from the Space Weather Prediction Center on Boulder, CO.

Fact: on three occasions alerts were sent out to the BAS aurora contact list.

Fact: I spent 6 hours waiting for aurora to appear Sep 10 at the Fox observatory.

Fact: I did not see one even decent glimmer of an aurora display.

BUT, my experience was the exception!

The first hint that something good was happening came from Doug and Paula Cunningham Read on.

*Hi John,
Splendid display tonight! Paula and I observed it from the back deck of our cottage. The display at times had spikes rising 50 degrees above the north horizon, there were some undulating curtains just above the north horizon and extending about 15 degrees above and some edge colors of faint pink. At times there were triple spikes rising to the left of Alkaid and continuing upwards for at least 50 degrees. Now at 11:30 things have quieted down to a 20 degree horizon glow extending in an arc of about 100 degrees centered beneath Polaris. Paula and I just looked and enjoyed the show. Best for me this year.
Doug*



Then I got the images (upper right and centre) from Steve Irvine in Big Bay! He saw the same display that was seen in Lion's Head (and not here in Owen Sound because of the clouds).

Finally, I received a third email and another image from a new BAS member Nick Cioran, who was also out and took a few images with his Nikon camera. He confirms that the green colour was actually what he saw and not a camera artifact.

I have said it before and I repeat, the Sun is still active and even on the down side of the cycle, it can still put on quite a display! Thank you, aurora watchers, wherever you are!





Detached Green Flash image by John H. Jan 16, 2009 1/8000s ISO 100 Canon 20D f/5.6 fl=170 mm overlooking the Pacific Ocean near San Simeon CA.

From the July 2015 issue of *Physics World*

Pete Lawrence is an astronomer, astrophotographer and a presenter on the BBC's *The Sky at Night*

Emerald emanation

As light passes through the atmosphere, it gets refracted. The thicker the layer it has to pass through, the more refraction occurs, so maximum refraction occurs close to the horizon. (When the Sun appears to be touching the horizon, in reality its disc has already set.) The atmosphere acts like a prism, refracting different wavelengths by varying amounts.

At sunset the Sun's light smears into a spectrum of colour, most of which overlaps and can't be seen individually. However, at the vertical extremes, you can sometimes notice a bluer top edge and a redder bottom edge. The effect is small, appearing like colour fringes when seen under magnification. Unless the air is very clean, the atmosphere scatters the blue fringe away leaving a green one. This is known as the "green rim", with the bottom red counterpart known as the "red rim". The same effect occurs around the rising Sun and the rising or setting Moon.

For a green rim to become a green flash, the atmosphere through which you're viewing the Sun needs to have the right temperature structure. The atmosphere's temperature normally reduces with height, but what is needed for a green flash is an inversion layer – a layer of warmer air sandwiched between cooler air on either side – below the observer's line of sight. This essentially creates a cylindrical lens, which both magnifies and visually detaches the upper green rim from the Sun's disc. If the conditions and timings are right, then as the last bit of Sun slips below the horizon, a thin, bright-green blob of detached sunlight can be seen hanging above the horizon – a purist's green flash.

A more common version occurs when the Sun remains just above the horizon or has partially set. Here, the green rim may simply elongate away from the Sun's edge, appearing more like a "green appendage". A less common appearance occurs as the Sun dips behind clouds close to the horizon – here a small inversion layer may be present at the top of the clouds, which can result in a "proper" detached green flash.

Lake Huron ideal for Seeing Green Flash

At a recent BAS meeting, several members commented on successfully seeing the green flash (some even twice). A quick show of hands around the audience revealed that about 1/3 of those there had seen it. All the stories of observing this elusive phenomenon were told with obvious enjoyment in successfully seeing this not-so-rare effect.

Your SGN editor can claim only a photographic observation and not a visual one, although there was a hint of something interesting going on to the naked eye. The image left only caught my eye after I reviewed the images on my memory card since I did not see anything remarkable visually. I caught the little lozenge of pale green on a remarkable day of watching elephant seals on the beach at San Simeon, CA on a winter trip we took to California in January 2009. It is the only green flash image I have, but it is definitely a keeper.

Advice on Seeing the Green Flash

from Andrew T. Young <http://www-rohan.sdsu.edu/~aty/index.html>

A major problem for people who have never seen a green flash is not knowing what to look for. Flashes are not always green; they are not a "flash" in the sense of a sudden burst of brightness (except at sunrise). They do not (usually) light up the sky, but are often small and inconspicuous. However, green flashes usually are brief: a duration of one or two seconds is typical at moderate latitudes.

Location, Location, Location!

If you want to see green flashes, you must be in the right place. [Green flashes have been seen regularly over the Great Lakes and the view westwards from Sauble Beach or the lake Huron shoreline is ideal. Look for a nice blue sky day with a crisp sun outline as the sun lowers in the west. -ed]

Rule # 1

A [sea horizon](#) (or equivalent) is guaranteed to be favorable. But, it isn't *necessary*. They can be seen from tops of mountains, or (in flat regions) a tall building. Airplanes and balloons also provide a high vantage point.

Rule # 2

The second important requirement is for reasonably clear air. If the air is full of dust, smog, or haze, there won't be enough green light transmitted at the horizon for you to see a green flash. [But don't give up on seeing it if it is hazy, sometimes this helps. -ed]

Rule # 3

Using optical aid, such as binoculars, or a camera viewfinder behind a long telephoto lens, will help. But, be careful. The Sun is [safe to look at](#), even with binoculars, when it's **right down on the astronomical horizon**. But it's a **lot** brighter just a few minutes earlier

at sunset. **The brightness changes by a factor of two every minute near sunrise and sunset**, so an error of just a minute or two can make the difference between eye safety and eye injury. Don't look at the Sun when it's more than its own diameter above the horizon. A sensible rule is: If the Sun is too bright to look at comfortably, don't look at it.

Rule # 4

Different circumstances favor different types of flash. Other types of flash occur in special circumstances: at cloud tops, over distant mountains, beneath very strong thermal inversions at very high latitudes. Where to look depends on your circumstances. More at the original website here: <http://www-rohan.sdsu.edu/~aty/index.html>

Photography

You need a telephoto to get a detailed image, start at 300mm. A 1000mm focal length works pretty well. If you are seriously interested in green-flash photography, I now have some more technical advice [here](#) on my Website.

Disclaimer

Although these "rules" will help maximize your chances of seeing a green flash, they are not without exceptions. The extreme variability of green-flash phenomena allows them to break almost any rule occasionally. But, granting all this, I still insist that the recommendations above will greatly increase your chances of seeing a flash. Though exceptions do occur, they are uncommon.

© 1999 – 2006, 2010, 2012 Andrew T. Young

[This is an edited version of the original at Young's website. Lots more good information can be found there. ed]

Hercules (Her)

α-Herculis - Ras Algethi ζ- Her - Rutilicus λ-Her - Masym
 β-Her - Kornephoros κ-Her - Marfik ω-Her - Cujam

The keystone shaped figure formed by the stars π, η, ζ and ε Herculis helps to identify this constellation; also the stars θ and ι -Herculis. representing respectively the bent left knee and the left foot of the kneeling Hercules, appear to rest directly on the head of Draco, the Dragon. It is one of the most ancient of the constellations. The outstanding feature of Hercules is the great globular cluster M13, the finest visible in the northern latitudes. On dark nights it is barely visible to the naked eye but it is easily seen in fieldglasses. A small telescope begins to reveal its beauty, while at least a 4" telescope is necessary to resolve the stars, In a large telescope, it is a never-to-be-forgotten sight. There are thought to be no less than 100,000 stars in this cluster. Ras Algethi is a binary and also an irregular variable, varying in magnitude from 3.1 to 3.9.

DOUBLE STARS

	Mag.	Sep (s)	Location	Remarks
α	3.1 to 3.9-5.4	5	171314	Orange-BI, beauty
γ	3.8-9.0	41	161919	White-Lilac,
δ	3.0-8.1	11	171325	Green-Pale Purple.
ζ	2.9-5.5	1	164032	
κ	5.3-6.5	29	160518	Yellow -Red,
μ	3.4-9.8	33	174528	
ρ	4.5-5.5	4	172237	Both Pale Green,
95	5.1-5.2	6	175922	Green-Red.
100	5.9-6.0	14	180526	A striking pair.
Σ2063	5.7-8.2	16	163146	
Σ2101	6.3-9.0	4	164436	
Σ2104	6.2-8.0	6	164736	Beautiful.
Σ2190	6.0-9.5	10	173421	
Σ2277	6.3-8.2-9.9	27-88	180249	Triple.

MESSIER OBJECTS (Her)

	Mag	Location	Remarks
M 13	5.7	164037	Globular Cluster. The "Hercules Cluster".
M 92	6.2	171643	Globular Cluster. [Also very nice! -ed]

Other Objects of Interest (Her)

- NGC 6210** -Planetary Nebula Magnitude 10, Location 164324
- u Herculis** -Eclipsing variable, magnitude range 4.8-5.3, period 2 days 1 hr. 12 min. Location 171533
- S Herculis** -Long period (307 days) variable, maximum mag. 7.6. Location 165015.

Hercules and the adjacent constellation Ophiuchus, have alpha stars that are not only near each other, but double stars to boot. Alpha-Herculis, Ras Algethi (Head of the Kneeler) is the only one that can be easily split at 5 seconds separation. The secondary star is 5.4 magnitude and the primary actually varies from 3.1 to 3.9 magnitude over a 128 day period. Compare it to κ-Oph (mag 3.2) on the other side of the triangle consisting of it and the "Ras" stars.

In Ophiuchus, Ras Alhague (Head of the Serpent Bearer) is only 0.5 seconds away from its partner and not splittable in amateur telescopes. The two constellations are depicted head-to-head with Hercules upside down in our northern sky.

Corona Borealis (CrB)

α-Coronae Borealis -Gemma β-Coronae Borealis - Nusakan

Corona Borealis is a very attractive semicircular group of stars between Hercules and Bootes, all the stars being of the 4th and 5th magnitudes with the exception of Gemma, the "Pearl of the Crown." There are a relatively large number of variable stars in this constellation; two of them, both irregular variables, are especially interesting. R Coronae (Location 162132) remains for months and sometimes years as a 6th magnitude star; then, for no apparent reason. it will decrease rapidly to the 12th or 13th magnitude. T Coronae is even stranger; normally a 9th magnitude star, in May 1866 it suddenly became very bright, reaching the 2nd magnitude. In 1946 it suddenly brightened again to the 3rd magnitude, only to fade again to its original brightness. It belongs to a special group of stars known as recurrent novae.

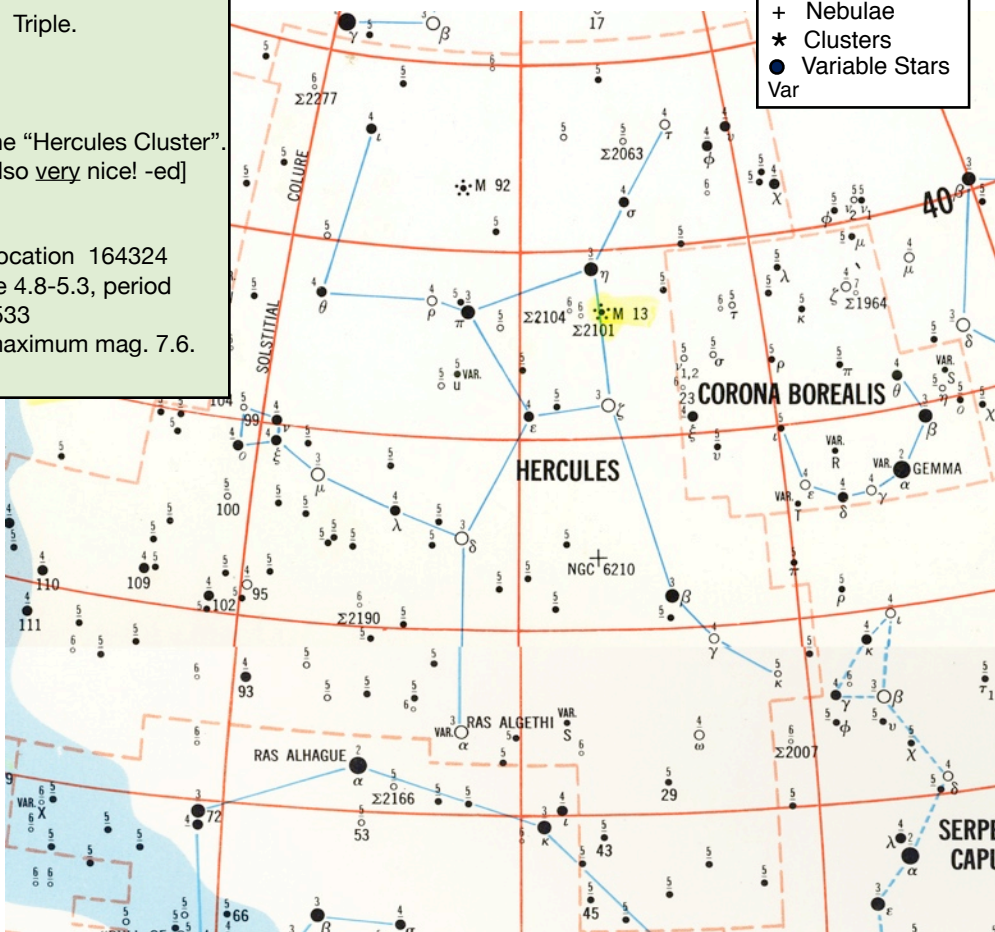
DOUBLE STARS

	Mag.	Sep (s)	Location	Remarks
ζ	5.1-6.0	6	153837	Greenish White-Green.
ε	6.0-7.0	0.8	152131	
ν	5.3-5.4	371	162034	Both Golden.
σ	5.8-6.7	5	161334	
Σ1964	7.3-7.4-8.8	15-2	153737	Triple.
23	6.3-8.8	35	162132	

Corona Borealis contains no Messier objects.

Chart Legend

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



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

- Oct 02** 09:53 Aldebaran occulted by Moon. Reapp. 10:53 DST
- 04** 17:06 **LQ Moon** rises locally at 23:26 EDT Oct 3
- 08** 16:32 Venus 0.7°N of Moon: Occ'n vis. in S.Pac. & Aus.
20:26 Venus-Regulus: 2.5°S
- 09** 12:51 Mars 3.4°N of Moon
19:30 Jupiter 2.7°N of Moon
- 11** 09:17 Moon at Apogee: 406 389 km
23:00 Uranus at Opposition mag. 5.7 (naked eye?)
- 12** 14:00 Mercury at Perihelion
20:06 **NM** rises locally at 07:07 EDT
- 15** 23:00 Mercury at Greatest Elong: 18.1°W
- 16** 09:20 Saturn 3.0°S of Moon
- 17** 10:00 Mars 0.4° N of Jupiter
- 20** 16:31 **FQ Moon** rises locally at 14:24 EDT
- 21** 19:00 **Orionid Meteors peak** (Moon 61% sets 12:24 am)
- 26** 03:00 Venus at Greatest Elong: 46.4°W
04:00 Venus 1.1° S of Jupiter
08:59 Moon at Perigee: 358 464 km
- 27** 08:05 **FM** rises locally at 18:50 EDT.
- 29** 09:53 Aldebaran 0.6° S of Moon Occ'n in E.Hemisphere

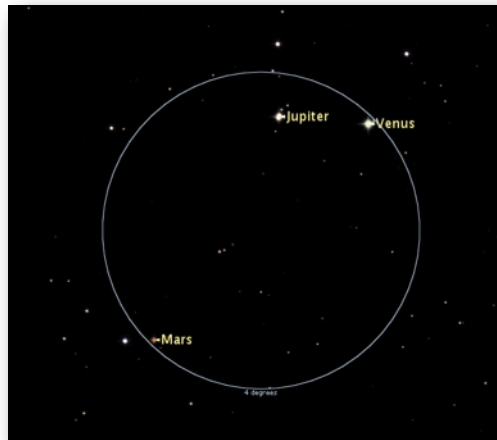
BAS Astronomy Events

- Oct 2 Aldebaran Occultation** Disapp. 9:53 am EDT, reapp. 10:53 am EDT (daytime) Moon near LQ
- Oct 4 Sun LQ**
- Oct 7 Wed** BAS meeting at Grey Roots Museum Speaker: Steve Briggs Optometrist
- Oct 8 Venus only 0.7° from Last Crescent Moon**
- Oct 9 Last Crescent Moon, Mars, Jupiter in a 5° triangle. Mercury close to horizon. Nice!**
- Oct 10 Sat** BAS viewing@Fox
- Oct 12 Mon NM and Uranus at opposition**
- Oct 20 Tue FQ**
- Oct 21 Orionid meteors:** 20/h peak at 7 pm Moon is 61% illuminated (just Past FQ) but sets by midnight.
- Oct 23 Fri** BWDSB trustees tour of ES Fox Observatory
- 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 on Oct 26. Venus-Jupiter separation 1° Oct 25, Venus-Mars sep. 0.7° Nov 3.
- Oct 27 Tue FM**

Special Events

Make sure you get out for some early morning planet-viewing during the last part of October. Venus, Mars and Jupiter are doing a flypast of each other in the last two weeks of October. All are within 7.5° of each other from Oct 17 to Nov 3. On Oct 17, Mars and Jupiter are only separated by 0.4°. The tightest group is on Oct 26 with Venus and Jupiter close and Mars 3° below (diagram right) fitting into a 4° circle. Venus-Jupiter separation is a mere 1° Oct 25, and then the Venus-Mars separation is 0.7° on Nov 3. Venus is the speedier of the three.

Three Morning Planet Show

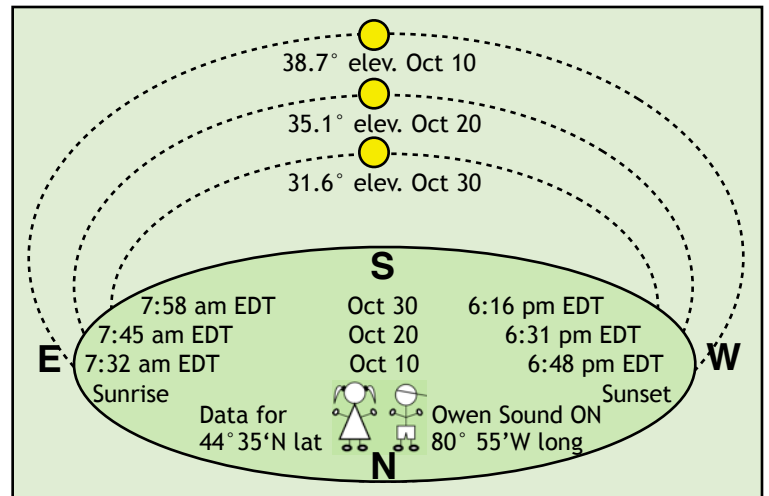


Planets

MERCURY, is a morning star and is good all month. It is farthest west of the Sun on Oct 15. It brightens rapidly to magnitude -1.0 by Oct 31 as it drops back towards the eastern horizon. **VENUS**, (-4.4) is well up in the dawn sky, slips past Jupiter on October 25/26, and then Mars in early November. **MARS** finally becomes easily seen in the morning sky. It is near Jupiter on Oct 17 and then is overtaken by Venus on Nov 3. Greatest elongation is on Oct 26. **JUPITER**, (-1.8) is well up in the dawn sky and grouped near Venus and Mars all October. Smallest triangle of three planets is around Oct 26. **SATURN**, (mag. 0.6) is very low in the SW sky and sets only an hour or so after the Sun does. Saturn viewing is over for this year. **URANUS**, (5.8) and **NEPTUNE**, (7.8) are visible in dark sky all month long. **Dwarf planet, Ceres (7.5)** is in Sagittarius and sets before midnight at month end. **Asteroid, Vesta (6.5)** follows Ceres in the sky and is well-placed in Pisces just under Uranus. **PLUTO** (mag. 14) is high on the meridian (24°) and in good position for viewing (with a large scope). It sets by midnight at month end. leads the asteroids and outer gas giants into the dawn sky. Vesta, Ceres and Pluto charts are on the BAS website.

The diagram below gives the sunrise/sunset times and the Sun's altitude for October. It continues to lower in elevation all month.

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.



Oct 2015

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
	By permission Univ. of Texas McDonald Obs					
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

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 Dobs 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)

Neil Turok and the Astonishing Simplicity of Everything: Webcast Trailer

THE ASTONISHING SIMPLICITY OF EVERYTHING
with **Neil Turok**

**LIVE WEBCAST OCT. 7, 2015
7 PM EDT**

www.perimeterinstitute.ca

**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>



The Perimeter Institute in Waterloo is hosting a Public Lecture Series that you can attend (no charge) in person or view as a webinar on Oct 7, 2015 at 7 pm. If you want to be there, you need to register for a ticket at the PI website. Similarly for the webinar. Go here: <http://www.perimeterinstitute.ca/> to do that or for more information on future speakers.

The first speaker is Neil Turok, (born 16 November 1958 is a South African physicist, and the Director of Perimeter Institute for Theoretical Physics. His work has been in the area of mathematical physics and early universe physics, including the cosmological constant and a cyclic model for the universe. His talk is on Cosmology and brings us up-to-date current thinking.

**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).

Light Humour c/o Perimeter Institute

Some animals can see light that we can't. Bees can see ultraviolet light, while pit vipers can see infrared. Puppies, meanwhile, see into your heart.

PI PERIMETER INSTITUTE

Cartoon Corner

NASA announces running water created certain features on Mars. During the press conference as depicted in the mind of Randall Munroe, a reporter asks:

HOW DOES THIS MARS DATA COMPARE TO DATA FROM OTHER FIELDS? LIKE MEDICINE? OR SPORTS?



Pacman Nebula

NGC 281 is an H II region in the constellation of Cassiopeia and part of the Perseus Spiral Arm. It includes the open cluster IC 1590, the multiple star HD 5005, and several Bok globules. Colloquially, NGC 281 is also known as the Pacman Nebula for its resemblance to the video game character. The nebula was discovered in August 1883 by E. E. Barnard, who described it as "a large faint nebula, very diffuse."

From Paul Zelichowski:

Here is the Pacman Nebula (NGC 281) in Narrowband, Sulfur is mapped to red 3hours, Hydrogen Alpha is mapped to green 3 hours, Oxygen is mapped to blue 2 hours 20 minutes. After some playing around, I got rid of some of the green from the hydrogen alpha which tends to be quite overpowering in narrowband images. This results in a more pleasing blue orange contrast similar to more familiar Hubble narrowband images.

