



Astronomy News for Bluewater Stargazers
Vol 8 No.10 Oct 2014

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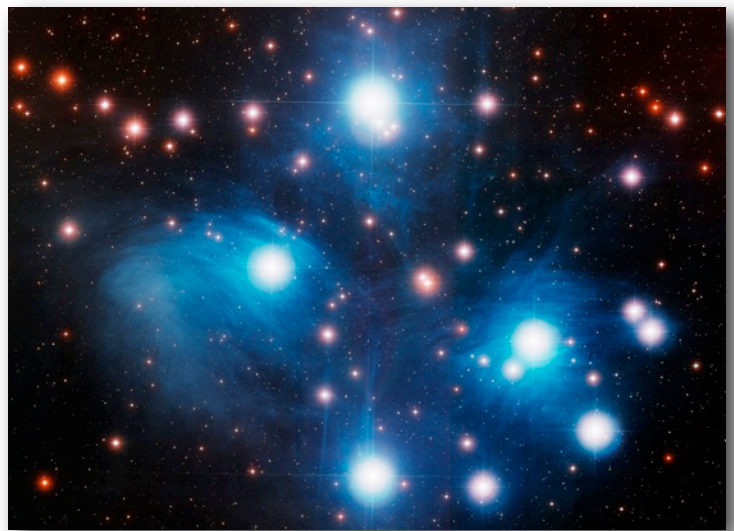
Distinct Terrains on Rosetta's Comet

This view of the "belly" and part of the "head" of comet 67P/Churyumov-Gerasimenko indicates several morphologically different regions. Scientists have analyzed images of the comet's surface taken by OSIRIS, Rosetta's scientific imaging system, and defined several different regions, each of which has a distinctive physical appearance. This analysis provides the basis for a detailed scientific description of 67P's surface.

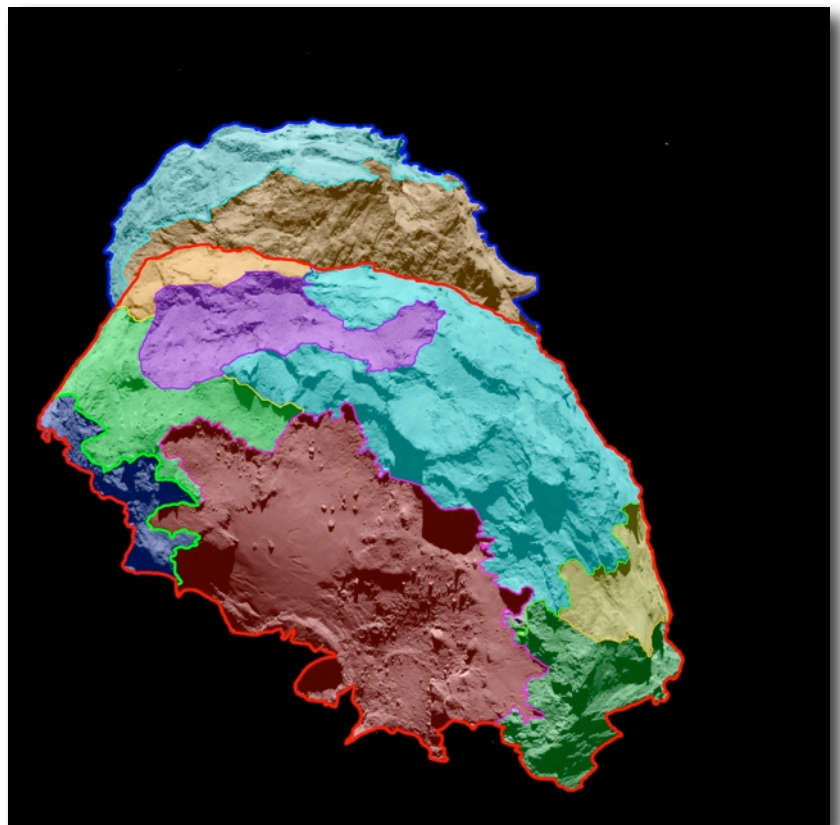
The comet has areas dominated by cliffs, depressions, craters, boulders and even parallel grooves. While some of these areas appear to be quiet, others seem to be shaped by the comet's activity, in which grains emitted from below the surface fall back to the ground in the nearby area.

As both comet 67P and Rosetta travel closer to the sun during the next few months, the OSIRIS team and other instruments on the payload will monitor the surface to look for changes. While scientists do not expect the borderlines they have identified for the comet's various regions to vary dramatically, even subtle transformations of the surface may help to explain how cometary activity created such a breathtaking world.

The scientific imaging system, OSIRIS, was built by a consortium led by the Max Planck Institute for Solar System Research (Germany) in collaboration with centers in Italy, France, Spain, the Netherlands, Sweden, and Germany.



A large telescopic long-exposure view of the Pleiades shows its beautiful dust cloud (the Merope Nebula) illuminated by the stars of the Seven Sisters in the foreground. Naked eyes views through even an 8-inch telescope hint at the bluish colour so much so that one amateur tried to wipe away the "haze" on the eyepiece. Radio telescopes have just refined the distance to M45 more precisely and resolved a controversy about the distance to the Pleiads. See page 3. **Image via NOAO/AURA/NSF.**

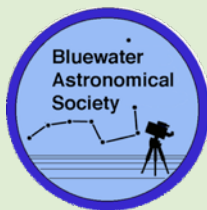


Rosetta is an ESA mission with contributions from its member states and NASA. Rosetta's Philae lander is provided by a consortium led by the German Aerospace Center, Cologne; Max Planck Institute for Solar System Research, Gottingen; French National Space Agency, Paris; and the Italian Space Agency, Rome. JPL, of Pasadena, manages the U.S. participation in the Rosetta mission for NASA.

For more information on the U.S. instruments aboard Rosetta, visit <http://rosetta.jpl.nasa.gov>. More information about Rosetta is available at: <http://www.esa.int/rosetta>.

Disclaimer: StarGazer News 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.

StarGazer News 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 your friends. Email comments and/or submissions to stargazer@wightman.ca



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From the "Top": by Aaron Top, president, BAS [See pg 6 and 7]

From the Editor: (1)

One of the talks at Starfest last August was by an auroral photographer named Yuichi Takasaka [images at <http://www.blue-moon.ca/>] whose talk was informative and very well-illustrated with his spectacular northern lights pictures. He re-iterated something that I had read but which had never really sunk in until this September. He mentioned that the fall was a time of more aurora events than average and after a quick look on Wikipedia I found this:

According to Janet Green, a physicist at the National Oceanic and Atmospheric Administration (NOAA), the times around the equinoxes are when geomagnetic storms — disturbances in the Earth's magnetic field — are strongest.

In fact, geomagnetic disturbances are almost twice as likely in spring and fall compared with winter and summer, according to 75 years of historical records analyzed by solar physicist David Hathaway of NASA's Marshall Space Flight Center in Alabama. Such disturbances are usually the cause for aurora displays.

So it looks like NASA statistics bear out the claim that fall (spring, too) is a better than average time to spot aurora.

So, none of us should have been surprised at the outbreak of northern lights in the middle of September. There was a week or so from Sep 12 to Sep 18 when night after night auroral displays occurred. However, most of these nights were clouded out unfortunately in the Bruce/Grey area and I got no reports of sightings from anywhere in Ontario. Even this "far-flung reporter" was skunked in St. Paul, MN, then in Calgary and also Kelowna on a trip Rebecca and I made to visit family out west. However, luck and a lot of persistence were with Aaron T. See his aurora images on pg 6 and 7. Good work, Aaron.

From the Editor: (2)

That same trip I took out west also cut into the time I had to finish the article on telescope construction that I started last issue. I will get the second half of the "Telescope Building Odyssey" into the next (Nov) issue of SGN.



BAS Events in Oct

- Oct 1 Wed** **BAS meeting** Grey Roots Museum 7 pm
Mike Tettenborn: Meteorites
- Oct 4 Sat** **OSFN star tour/talk** ES Fox 7:00 pm
FQ+3 Leader: John H.(alt. date Oct 18 LQ+3)
- Oct 8 Wed** **Lunar Eclipse** BAS viewing from 6th St N
FM Washrooms in Sauble Beach. Totality 6:25 am DST to 7:24 am DST. Moon sets 7:37 am.
- Oct 19 Sun** **Comet Siding Spring (C/2013A1)** closest to Mars
photo op! (from Mars only)
- Oct 21 Tue** **Orionid meteors**, 20/h peak at noon Oct 21,
NM-2 Moon only 5% observe Oct 20 & Oct 21 evenings
- Oct 23 Thu** **Partial Solar Eclipse** first half only, viewing from
NM 6th St N washrooms in Sauble Beach followed by viewing at ES Fox @dark.
First contact 5:36 pm DST. Sun sets at 6:26 pm.

Astronomical Events in Oct

- Oct 7 Tue (FM-1)** **Uranus at opposition** (mag 7.9)
- Oct 8 Wed (FM)** **Second Lunar Eclipse of 2014** from 6th St N
Washroom/pavillion in Sauble Beach. Umbral contact 5:14 am
DST Oct 8, total phase from 6:25 am to 7:24 am DST Oct 8. Last
Umbral contact 8:34 am DST. Moon sets 7:37 am Oct 8.
- Oct 19 Sun (NM)** **Comet Siding Spring (C/2013A1)** closest to
Mars -photo op! (from Mars only)
- Oct 21 Tue (NM-2)** **Orionid meteors**, 20/h peak at noon Oct 21,
Moon only 5% observe Oct 20 & Oct 21 evenings
- Oct 23 Thu (NM)** **Partial Solar Eclipse** first half only visible
from Bruce-Grey, viewing from 6th St N washroom in Sauble
Beach followed by viewing at ES Fox @dark. First contact at 5:36
pm DST. Sun sets at 6:26 pm DST. Mid-eclipse is about 13
minutes later but Sun is below our horizon.
- Oct 27 Mon (NM+4)** **Mars** 0.5° S of Lagoon Nebula M8

Radio Telescopes Settle Controversy Over Distance to Pleiades

Press Release: NRAO Aug 28/14

Pleiades Distance now 443 ly (1%acc.)

Astronomers have used a worldwide network of radio telescopes to resolve a controversy over the distance to a famous star cluster -- a controversy that posed a potential challenge to scientists' basic understanding of how stars form and evolve. The new work shows that the measurement made by a cosmic-mapping research satellite was wrong.

The astronomers studied the Pleiades, the famous "Seven Sisters" star cluster in the constellation Taurus, easily seen in the winter sky. The cluster includes hundreds of young, hot stars formed about 100 million years ago. As a nearby example of such young clusters, the Pleiades have served as a key "cosmic laboratory" for refining scientists' understanding of how similar clusters form. In addition, astronomers have used the measured physical characteristics of Pleiades stars as a tool for estimating the distance to other, more distant, clusters.

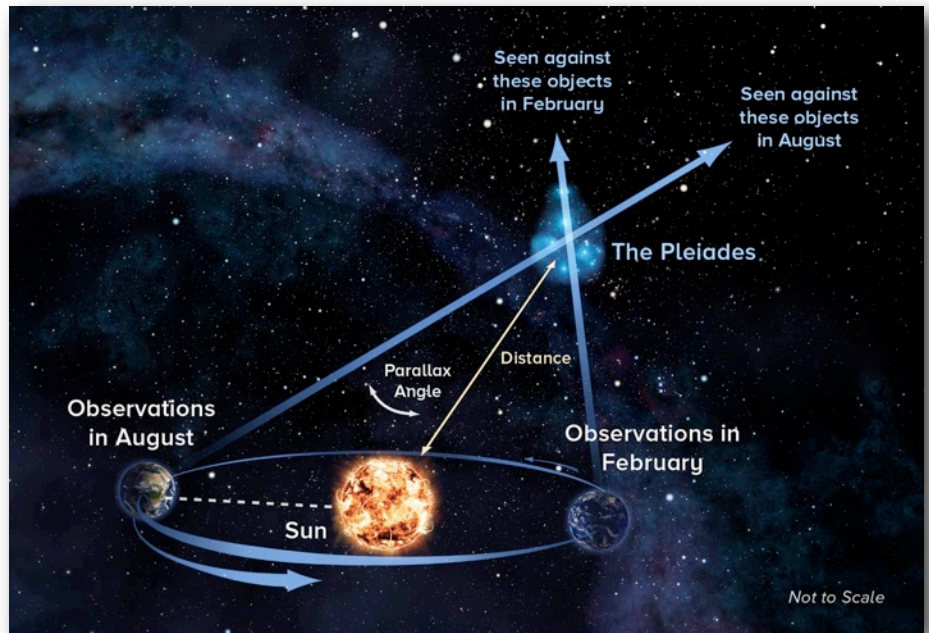
Until the 1990s, the consensus was that the Pleiades are about 430 light-years from Earth. However, the European satellite Hipparcos, launched in 1989 to precisely measure the positions and distances of thousands of stars, produced a distance measurement of only about 390 light-years.

"That may not seem like a huge difference, but, in order to fit the physical characteristics of the Pleiades stars, it challenged our general understanding of how stars form and evolve," said Carl Melis, of the University of California, San Diego. "To fit the Hipparcos distance measurement, some astronomers even suggested that some type of new and unknown physics had to be at work in such young stars," he added.

To solve the problem, Melis and his colleagues used a global network of radio telescopes to make the most accurate possible distance measurement. The network included the Very Long Baseline Array (VLBA), a system of 10 radio telescopes ranging from Hawaii to the Virgin Islands; the Robert C. Byrd Green Bank Telescope in West Virginia; the 1,000-foot-diameter William E. Gordon Telescope of the Arecibo Observatory in Puerto Rico; and the Effelsberg Radio Telescope in Germany.

"Using these telescopes working together, we had the equivalent of a telescope the size of the Earth," said Amy Miouduszewski, of the National Radio Astronomy Observatory (NRAO). "That gave us the ability to make extremely accurate position measurements -- the equivalent of measuring the thickness of a quarter in Los Angeles as seen from New York," she added.

The astronomers used this system to observe several Pleiades stars over about a year and a half to precisely measure the apparent shift in each star's position caused by the Earth's rotation around the Sun. Seen at opposite ends of the Earth's orbit, a star appears to move slightly against the backdrop of more-distant cosmic objects. Called parallax, the technique is the most accurate distance-measuring method astronomers have, and relies on simple trigonometry. [See diagram upper right.]



The result of their work is a distance to the Pleiades of 443 light-years, accurate, the astronomers said, to within one percent. This is the most accurate and precise measurement yet made of the Pleiades distance.

"This is a relief," Melis said, because the newly-measured distance is close enough to the pre-Hipparcos distance that the standard scientific models of star formation accurately represent the stars in the Pleiades.

"The question now is what happened to Hipparcos?" Melis said. Over four years of operation, the spacecraft measured distances to 118,000 stars. The cause of its error in measuring the distance to the Pleiades is unknown. Another spacecraft, Gaia, launched in December of 2013, will use similar technology to measure distances of about one billion stars.

"Radio-telescope systems such as the one we used for the Pleiades will provide a crucial cross-check to insure the accuracy of Gaia's measurements," said Mark Reid, of the Harvard-Smithsonian Center for Astrophysics.

Many ancient cultures, including Native Americans, used the Pleiades as a test of vision. The more Pleiades stars one can discern -- typically five to nine -- the better one's vision.

"Now we've used a system that provides modern astronomy's sharpest 'vision' to solve a longstanding scientific debate about the Pleiades themselves," said Melis.

Melis, Miouduszewski, and Reid worked with John Stauffer of the Spitzer Science Center, and Geoffrey Bower of the Academia Sinica Institute of Astronomy and Astrophysics. The scientists published their findings in the 29 August issue of the journal *Science*.

The National Radio Astronomy Observatory is a facility of the National Science Foundation, operated under cooperative agreement by Associated Universities, Inc.

Dave Finley, Public Information Officer dfinley@nrao.edu

Evidence for Supernovas Near Earth

August 26, 2014: Once every 50 years or so, a massive star explodes somewhere in the Milky Way. The resulting blast is terrifyingly powerful, pumping out more energy per second than the sun in a million years, outshining the entire Milky Way.

It seems obvious that you wouldn't want a supernova exploding near Earth. Yet there is growing evidence that more than one did. About 10 million years ago, a nearby cluster of supernovas went off like popcorn. The explosions blew an enormous bubble in the interstellar medium, and we're inside it.

Astronomers call it "the Local Bubble." It is peanut-shaped, about 300 light years long, and filled with almost nothing. Gas inside the bubble is very thin (0.001 atoms per cubic centimeter) and very hot (roughly a million degrees)—a sharp departure from ordinary interstellar material.

The Local Bubble was discovered gradually in the 1970s and 1980s. Optical and radio astronomers looked carefully for interstellar gas in our part of the galaxy, but couldn't find much in Earth's neighborhood. Meanwhile, x-ray astronomers were getting their first look at the sky using sounding rockets and orbiting satellites, which revealed a million-degree x-ray glow coming from all directions. It all added up to Earth being inside a bubble of hot gas blown by exploding stars.

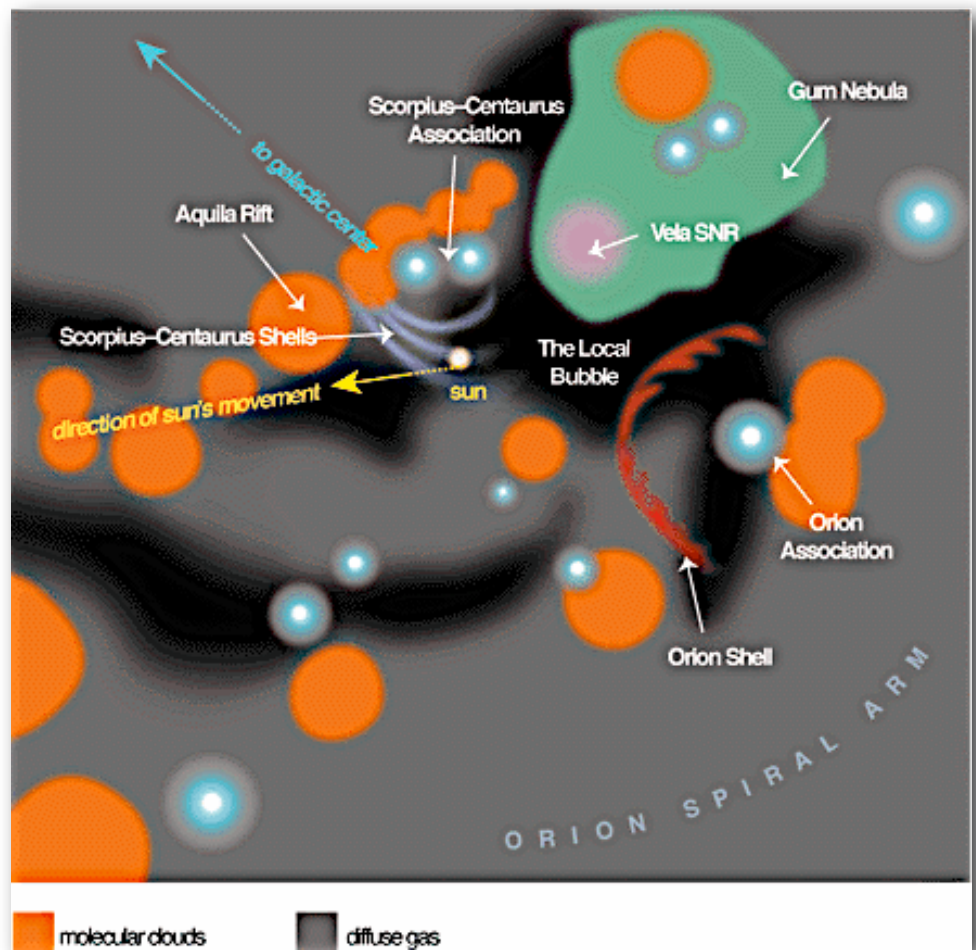
However, not all researchers agreed.

"Within the last decade, some scientists have been challenging the [supernova] interpretation, suggesting that much or all of the soft X-ray diffuse background is instead a result of charge exchange," says F. Scott Porter of the Goddard Space Flight Center.

"Charge exchange": Basically, it happens when the electrically-charged solar wind comes into contact with a neutral gas. The solar wind can steal electrons from the neutral gas, resulting in an X-ray glow that looks a lot like the glow from an old supernova. Charge exchange has been observed many times in comets.

So, is the X-ray glow that fills the sky a sign of peaceful "charge exchange" in the solar system or evidence of terrifying explosions in the distant past?

To find out, an international team of researchers including Porter and led by



The Local Bubble and the Galactic Neighborhood

Illustration Credit & Copyright: Linda Huff (American Scientist), Priscilla Frisch (U. Chicago)

Explanation: The above map of the surrounding 1500 light years is constructed from various observations and deductions. Currently, the Sun is passing through a Local Interstellar Cloud (LIC), shown in violet, which is flowing away from the Scorpius-Centaurus Association of young stars. The LIC resides in a low-density hole in the interstellar medium (ISM) called the Local Bubble, shown in black. Nearby, high-density molecular clouds including the Aquila Rift surround star forming regions, each shown in orange. The Gum Nebula, shown in green, is a region of hot ionized hydrogen gas. Inside the Gum Nebula is the Vela Supernova Remnant, shown in pink, which is expanding to create fragmented shells of material like the LIC. Future observations should help astronomers discern more about the local Galactic Neighborhood and how it might have affected Earth's past climate.

physics professor Massimiliano Galeazzi at the University of Miami in Coral Gables, developed an X-ray detector that could distinguish between the two possibilities. The device was named DXL, for Diffuse X-ray emission from the Local Galaxy.

On Dec. 12, 2012, DXL launched from White Sands Missile Range in New Mexico atop a NASA Black Brant IX sounding rocket, reaching a peak altitude of 160 miles and spending five minutes above Earth's atmosphere. That was all the time they needed to measure the amount of "charge exchange" X-rays inside the solar system.

The results, published online in the journal Nature on July 27, indicate that only about 40 percent of the soft X-ray background originates within the solar system. The rest must come from a Local Bubble of hot gas,

the relic of ancient supernovas outside the solar system.

Obviously, those supernovas were not close enough to exterminate life on Earth—but they were close enough to wrap our solar system in a bubble of hot gas that persists millions of years later.

"This is a significant discovery," said Galeazzi. "[It] affects our understanding of the area of the galaxy close to the sun, and can, therefore, be used as a foundation for future models of the galaxy structure."

The next flight of DXL is currently planned for December 2015.

Credits:

Production editor: [Dr. Tony Phillips](#) | Credit: Science@NASA

Latest Offerings from BAS Astrophotographers



The photograph above was featured on the SkyNews Magazine website.
[See more at <http://www.steveirvine.com/astro>]

Steve Irvine Image: Venus and Jupiter Conjunction, August 18, 2014. Steve writes: I had been looking forward to this close conjunction of the planets Venus and Jupiter for quite some time. One of the nice things about astronomy is that particular events can be predicted years or even decades in advance, and this closest pairing in fourteen years of the two brightest planets was much anticipated. One of the things that can't be predicted long in advance is cloud cover, and when I arrived at the site I had chosen for the photograph on the shore of Georgian Bay the eastern sky, and the conjunction were hidden behind a cloud bank. There was a clear section of the sky slowly moving towards the location of the planets, and after 20 minutes of waiting the glittering pair were finally revealed. Venus is the brighter of the two.



This image shows not just the ISS but several aircraft passing through the sky above Keppel Henge. There is also at least one bright Iridium flare (to the left of the North Pole Stone just above the tree line). Close inspection also shows at least one faint satellites as well - a typical sky at night. There are some hot R and B pixels as well that were not photoshopped out. Software used to stack these images was StarStaX: <http://www.markus-enzweiler.de/software/software.html>

John Hlynialuk Image: ISS passes over Keppel Henge, August 15, 2014. Star trails over the monoliths at Keppel Henge have long been on my wish list for images and when the ISS started a series of passes through the two Bear constellations it only made it more interesting. This image is the result of stacking 124 images taken on the night of Aug 15 when ISS appeared in the west and disappeared into the Earth's shadow at 10:41 pm Aug 15. Program used was StarStaX - a free application (see below). Photoshop was used to fill in the gaps in the ISS trail and bringing out the North Star Stone and Pointer. Individual images were 10 second shots at ISO 3200 with a 10 mm f/2.8 lens.



More from BAS Astrophotographers



Lagoon and Trifid Nebulas by Frank Williams Image total exposure was 5 hours with 85 mm refractor telescope, processed in Pixinsight, with cropping, deconvolution, and not touched by Photoshop. Taken in August before the full moon. Better than my previous version due to better camera and processing. [Agreed! -ed]



August Aurora!

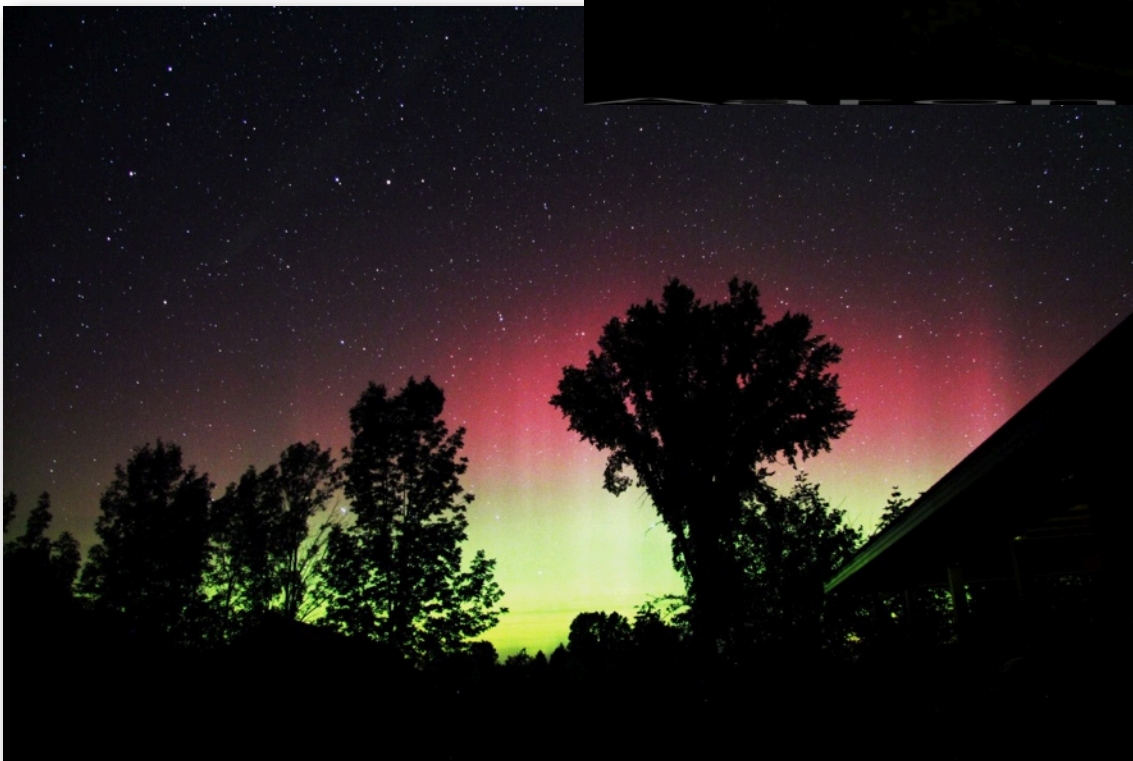
Aug 27 Aurora by Aaron Top: Canon 60Da, 30 s exposure with 20 mm focal length at f/4 ISO 2500 Aug 27, 2014 at 11:58 pm. Note the reflection of the Big Dipper in the water.

September Aurora Too!

Aug 11, 2014 Aurora
by Aaron Top: No other info
provided



Sep 9, 2014 Aurora
by Aaron Top: no other
info provided



Sep 21 Aurora
by Aaron Top: Canon
60Da, 30 s exposure
with 20 mm focal length
at f/4 ISO 2500 Sep 21,
2014.
Image from outside ES
Fox Observatory

Simon Nyalungu and South Africa's Tswaing Meteor Crater

"Black Swan On First Looking into the Tswaing Meteorite Crater"

In single file we climbed the narrow trail,
Through bramble thicket to the crater's rim.
Where warming sun cast shadows on the brim,
and bathed the bushveld scrub and scattered shale.

Concealed the gently waving grass,
By saline lake, the haunt of duck and plover.
Lay snakes and lizards in the rain-soaked clover,
On diaplectic quartz and feldspar glass.

In prehistoric stone-age time of yore,
At hypersonic speed a chondrite fell
On thunderstruck impala and gazelle,
And vaporized upon the forest floor,

Black Swans are not so rare, I hear you say !
Beware ! One may befall this very day !
by **Keith Moffatt**

Between January 17th and 20th, 2011, Keith Moffatt, author of the above poem, attended an international workshop entitled, "Extreme Natural Hazards and Disaster Risk in Africa", held in Pretoria, South Africa. Moffatt, whose expertise is in the Geophysics of Extreme Events, is a professor in the Department of Theoretical Physics and Applied Mathematics at the University of Cambridge in the UK. The purpose of the workshop was to evaluate major topics related to extreme events and disaster risks and provide recommendations to African governments. A Black Swan event, like the impact of a large asteroid on Earth or a financial depression, is an event that is highly improbable but, if it occurs, can be potentially destructive and destabilizing. The purpose of the conference was to identify potential Black Swan events that could severely impact African countries and provide recommendations to national governments. During the course of the conference, the attendees had an opportunity to visit the site of a prehistoric Black Swan event, the Tswaing Meteorite crater, and Keith Moffatt penned the poem above in response to his visit.

After an extensive tour of Namibia, and, on our way to visit the Mala Mala Game Reserve in South Africa, Paula, I, and the Hladiuk family (Don, Marianne, and their daughters, Natasha, and Marla) detoured for a day to visit this famous Tswaing crater, located 40 km NW of Pretoria. It is probably the most beautifully preserved crater of its kind in the world and provides numerous habitats for bird life with 240 recorded species and game animals. We arrived at the Tswaing Meteor Crater Interpretative Center just before lunch and met the Director, Simon Nyalungu. Simon was a most knowledgeable and gracious host and he was our personal interpretative guide for the next 7 hours.

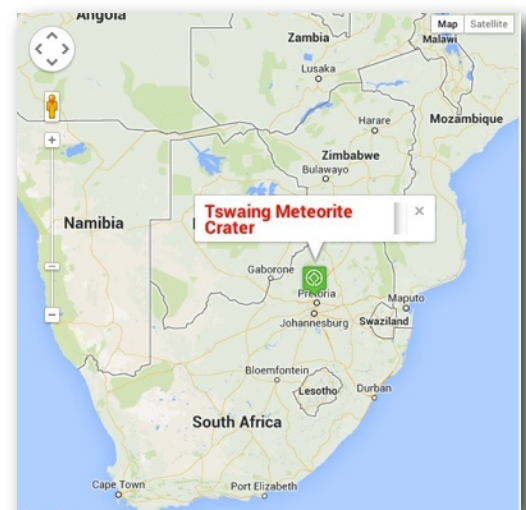
After our lunch, Simon led us along the 7.2 km Tswaing Crater's "rim to floor" hiking trail. This trail is one of the few hiking trails in the world that actually descends to a meteor impact's crater floor. In contrast, at Arizona's famous Meteor Crater, visitors can only access a small section of the rim and, hiking to its bottom, is not permitted. To get our first views of the crater depression, we had to hike about a kilometre from the interpretative centre and, in the process, climb



Below: Aerial Photo Tswaing Meteor Crater



about 60 metres to access the crater rim. As we gazed into the crater floor, 100 metres below us, Simon explained that the chondritic meteoroid that excavated the depression hit the Earth 200,000 years ago. The meteoroid was about 50 metres in diameter and estimated to be traveling at 40 km per second. The impact, which obliterated the meteoroid, released an energy roughly equivalent to that produced by the first US hydrogen bomb test at Eniwetok atoll in the the Marshall Islands in 1952. The resulting meteorite crater was 1.13 km in diameter and about 200 metre in depth. Scientists estimate that all life within a 35 km radius was extinguished in the impact. Since then, accumulated sediment has reduced the crater depth to slightly more than 100 metres. The included pictures show that the crater has a small, circular, salt lake in its center. The seepage of ground water, with its dissolved salts into the crater bottom, continually replenished the salt, which was used as a source of industrial salt for many years.



*Location of
Tswaing Crater in
Africa*



Left: *Simon Nyalungu at the Crater Rim (Web Photo)*



Right: *Rim View of Tswaing Meteor Crater (photo by D. Cunningham)*

Group Photo at Shoemaker Look-off: L to R: *Don Hladiuk, Simon Nyalungu, Doug and Paula Cunningham, Marla Hladiuk, Marianne Hladiuk (Natasha Hladiuk Photo)*

After hiking about 1/3 of the rim circumference, we came upon Shoemaker Look-off, named after Gene Shoemaker, the originator of impact cratering studies and the pioneer of astrogeology. A special plaque had been placed at this spot in his honour. Simon then led us along the crater circumference to the descent trail leading to the crater bottom and the salt lake below. In the distance, we could see the surrounding adjacent Townships, containing over a million residents, and shanties as far as the eye could see. Simon explained that the Tswaing Conservation authorities are consulting with the surrounding local communities in an attempt to reduce both game poaching and scavenging for firewood within the conservation authority's boundaries. The Tswaing authorities are even considering building an electric security fence to protect their conservation environment.



Soon, we found ourselves at the bottom of the crater, standing next to the salt encrusted lake. There were a number of birds flying about and Simon identified them for us. He then explained the mechanics of the salt extraction, a process which involved pumping the salt water out of the crater and then, after evaporating the water, harvesting the salt. On our return to the Interpretive Center, Simon showed us the ruins of the industrial evaporators.

It was now getting late in the day and we still had a long drive to our accommodations in Johannesburg in preparation for our morning flight to the Mala Mala Game Reserve. Simon had been our host and

guide for 7 hours and we were sorry to say good-bye to him. He was excellent! Don had brought along a copy of the 2014 RASC Observer's Handbook and we presented Simon with it, along with a substantial tip (not requested) in recognition of his wonderful tour. Simon graciously accepted the tip, but he was most pleased to receive the Handbook. He had a long 8 km walk back to his Township home and we hoped he would make it by nightfall. There was a fork in the dusty road, and, as Simon walked down the west branch, he was backlit by the setting sun. He turned back to us and gave a vigorous wave and then continued walking, and, get this, joyously reading his copy of the RASC Observer's Handbook. What a great day! One that will be long etched in our memories.

Merging Galaxies Illuminate the Cosmic Food Chain



MAUNA KEA, HAWAII – Scientists studying a ‘twin’ of the Milky Way have used the W. M. Keck Observatory and Subaru Observatory to accurately model how it is swallowing another, smaller galaxy. Their findings have opened the way to a better understanding of how structure forms in the universe and are being published in the *Monthly Notices of the Royal Astronomical Society* this week.

The work, led by Caroline Foster of the Australian Astronomical Observatory, has used the Umbrella (NGC 4651) galaxy to reveal insights in galactic behavior.

The Umbrella lies 62 million light-years away, in the northern constellation of Coma Berenices. Its faint parasol is composed of a stellar stream, thought to be the remnants of a smaller galaxy being pulled apart by the large galaxy’s intense gravitational field. The Umbrella will eventually absorb this small galaxy completely.

The merging of small galaxies into larger ones is common throughout the universe, but because the shredded galaxies are so faint it has been hard to extract details in three-dimensions about how such mergers proceed. Using the most powerful optical facilities in the world, the twin, 10-meter Keck Observatory and the 8-meter Subaru Telescope, near the summit of Mauna Kea, Foster and her collaborators have determined enough about the character of the merger to provide a detailed model of how and when it occurred.

After taking panoramic images of the Umbrella with Suprime-Cam on Subaru, the scientists used the DEIMOS instrument, installed on the Keck II telescope, to map

out the motions of the stream and hence determine how the galaxy is being shredded.

The stars in the stream are incredibly faint, so it was necessary to use a proxy technique to measure the speeds of brighter tracer objects moving along with the stream stars. These bright tracers include globular star clusters, planetary nebulae (dying stars that glow like neon lights), and patches of glowing hydrogen gas.

“This is important because our whole concept about what galaxies are and how they grow has not been fully verified,” said co-author Aaron Romanowsky, an astronomer at both San José State University and University of California Observatories. “We think they are constantly consuming smaller galaxies as part of a cosmic food chain, all pulled together by a mysterious form of invisible ‘dark matter’. When a galaxy is torn apart, we sometimes get a glimpse of the hidden vista because the stripping process lights it up. That’s what occurred here.”

“Through new techniques we have been able to measure the movements of the stars in the very distant, very faint, stellar stream in the Umbrella,” Foster said. “This allows us, for the first time, to reconstruct the history of the system.”

“Being able to study streams this far away means that we can reconstruct the assembly histories of many more galaxies,” Romanowsky said. “In turn that means we can get a handle on how often these ‘minor mergers’ — thought to be an important way that galaxies grow — actually occur. We can also map out the orbits of the stellar streams to test the pull of gravity for exotic effects,

JUNE 30, 2014
Keck Observatory

http://www.keckobservatory.org/recent/entry/merging_galaxies_illuminate_the_cosmic_food_chain

Umbrella Galaxy has Lunch

The Umbrella Galaxy takes its name from a mysterious feature seen on the left here, that is now found to be debris from a tiny galaxy, only a 50th its size, shredded apart by gravity. The image is a combination of data from the 0.5-meter BlackBird Remote Observatory Telescope and Suprime-Cam on the 8-meter Subaru Telescope. The inset shows a small cluster of stars embedded in the stream, which marks the center of the disrupted galaxy.

CREDIT: R. JAY GABANY

much like the Moon going around the Earth but without having to wait 300 million years for the orbit to complete.”

The present work is a follow-up to a 2010 study, led by Dr. David Martínez-Delgado (University of Heidelberg), which used small robotic telescopes to image eight isolated spiral galaxies, and found the signs of mergers — shells, clouds and arcs of tidal debris — in six of them.

The W. M. Keck Observatory operates the largest, most scientifically productive telescopes on Earth. The two, 10-meter optical/infrared telescopes on the summit of Mauna Kea on the Island of Hawaii feature a suite of advanced instruments including imagers, multi-object spectrographs, high-resolution spectrographs, integral-field spectroscopy and world-leading laser guide star adaptive optics systems.

DEIMOS (the DEep Imaging and Multi-Object Spectrograph) boasts the largest field of view (16.7 arcmin by 5 arcmin) of any of the Keck instruments, and the largest number of pixels (64 Mpix). It is used primarily in its multi-object mode, obtaining simultaneous spectra of up to 130 galaxies or stars. Astronomers study fields of distant galaxies with DEIMOS, efficiently probing the most distant corners of the universe with high sensitivity.

Keck Observatory is a private 501(c)3 non-profit organization and a scientific partnership of the California Institute of Technology, the University of California and NASA.

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This month features all the videos that were shown at the movie night Aug 6 at the Fox (plus one more). Most are Youtube videos and should still be viewable using the links provided. Clicking on each link in blue should take you directly to the video which you can then view in your web browser. If that doesn't work, copy the entire address that is underlined, open your web browser and paste it into address box.

Neil deGrasse Tyson fixes Titanic sky

"You've got the WRONG SKY!"

Tyson takes on Hollywood and comes out on top.



http://www.youtube.com/watch?feature=player_embedded&v=YXh9RQCvxmg#!

Astronomy & Space News Sources:

NASA: <http://science.nasa.gov/>

EarthSky: <http://earthsky.org>

Physics World: <http://physicsworld.com/>

Universe Today: <http://www.universetoday.com/>

Sky News: <http://www.skynews.ca/>

Sky & Telescope: <http://www.skyandtelescope.com/>

Astronomy: <http://www.astronomy.com/>

Spaceweather: <http://spaceweather.com>

One-Minute Astronomer: <http://oneminuteastronomer.com/>

Best Chelyabinsk videos

Collection of the best Chelyabinsk video many never seen.



http://www.youtube.com/watch?feature=player_embedded&v=dpmXyJrs7iU

Chris Hadfield tests out Space Game



<http://www.tested.com/science/space/455596-chris-hadfield-tests-jamie-and-adams-space-game/>

<http://thecreatorsproject.vice.com/show/video-stunning-timelapse-sheds-new-light-on-california>

Michael Shainblum talks about what inspires his astrophotography and shows some of his incredible images.



Jellyfish flames on the ISS -unique!

<http://www.youtube.com/watch?v=bE13FREpFVo&feature=youtu.be>



Aquila (Aqu)

α -Aquilae - Altair γ -Aquilae - Tarazed λ -Aquilae - Althaimain
 β -Aquilae - Alshain ζ -Aquilae - Dheneb

Aquila is well named; even more than Cygnus, it has the appearance of a bird with outspread wings, Altair being its head. Altair has a magnitude of 0.9 and is the 11th brightest of the stars. With its two companions β and γ -Aquilae, it is an attractive sight in the sky; these three stars are known as the "Family of Aquila." η -Aquilae is a Cepheid (short period) variable; it varies in magnitude from 3.5 to 4.5 and back again in slightly over 7 days. NGC 6709, an open cluster, can be viewed in binoculars.

DOUBLE STARS

	Mag.	Sep'n (s)	Location	Remarks
ζ	3.0-12	5	190314	
π	6.0-6.8	1.4	194712	Test for 3" telescope.
5	5.9-7.4	13	184401	White-Pale Blue.
11	5.7-9.2	17	185714	Pale Green-Ashen.
15	5.5-7.2	38	190204	White-lilac.
57	5.8-6.5	36	195208	Pale Yellow-Pale Green.
Σ 2446	6.3-8.3	10	190407	
Σ 2628	6.5-8.5	4	200609	Yellow-lilac.
Σ 2644	6.8-7.1	3	201001	
Σ 2654	6.2-7.7	14	201404	

Other Objects of Interest in Aquila

NGC 6709 - Open Cluster. Location 184910.

R Aquilae -long period (351 days) variable, magnitude range 6.1-11.5. Location 190408.

η -Aquilae - Cepheid (short period) variable; see above. Location 195001.

Scutum (Scu)

Scutum is a small, faint constellation lying between the three great constellations of Aquila, Ophiuchus and Sagittarius. Its four brightest stars are in the shape of a great elongated diamond. The two brightest stars, α and β -Scuti, have magnitudes of 4.1 and 4.5 respectively. It lies in the Milky Way and therefore does not stand out very well. M 11, a "semi-globular" open cluster, is visible to the naked eye. [Many of us see it as a "Borg Cube" -ed]

DOUBLE STARS

	Mag.	Sep'n (s)	Location	Remarks
Σ 2306	7.2-7.9	12	181915	Yellow-Deep Blue; beaut.
Σ 2325	6.0-9.3	12	182810	

MESSIER OBJECTS (Scu)

	Mag	Location	Remarks
M 11	6.3	184806	Open Cluster. Called semi-globular.
M 26	9.3	184309	Open Cluster. Coarse.

Vulpecula (Vul)

Vulpecula is a small, faint constellation south of Cygnus; its brightest star, 13 Vulpeculae has a magnitude of 4.5.

MESSIER OBJECTS (Vul)

	Mag	Location	Remarks
M 27	7.6	195822	Planetary Nebula. The famous Dumbbell Nebula whose shape is indicated by its name. Use low power when observing.

Other Objects of Interest in Vulpecula

T Vulpeculae -short period (4 d 10.5 h) variable, magnitude range 5.5-6.5. Location 205028.

Sagitta (Sge)

Sagitta is a small constellation, but its four brightest stars form a prominent and easily recognized shape that really resembles an arrow. It lies about halfway between β -Cygni and Altair in Aquila. Sweep this beautiful Milky Way area with binoculars.

DOUBLE STARS

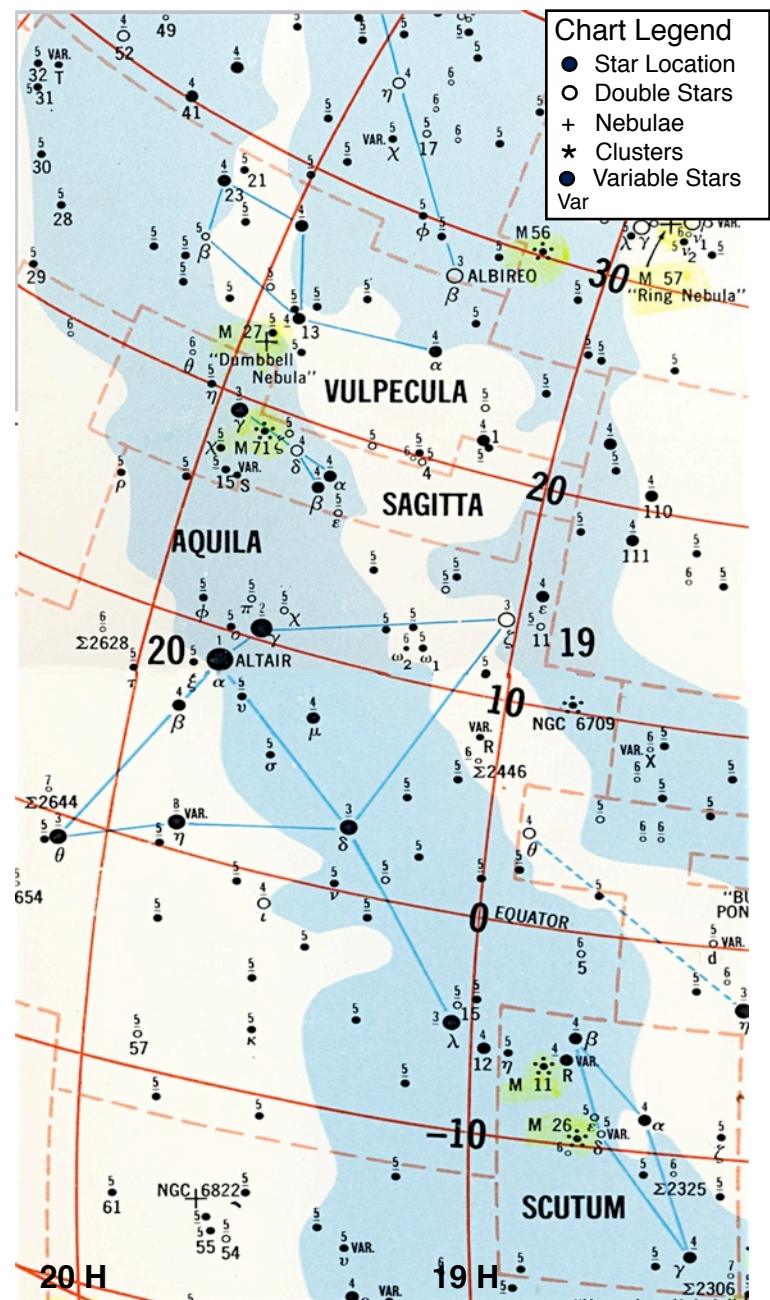
	Mag.	Sep'n (s)	Location	Remarks
ϵ	5.7-7.7	90	193516	
ζ	5.0-8.7	8	194719	Green-Blue.
θ	6.3-8.5-7.1	12-80	200821	Yellow-Ashen.Triple.

MESSIER OBJECTS (Sge)

	Mag	Location	Remarks
M 71	6.1	195219	Globular Cluster.

Other Objects of Interest in Sagitta

15 Sagittae lies in a beautiful field; just north of this star look for a striking sapphire-coloured star. Scan with low power the areas around η -Sagittae and just south of M71; these fields contain many beautiful pairs and triples.



- Oct 01** 14:33 **FQ Moon** rises locally at 2:23 pm DST
- 06** 04:41 Moon at Perigee: 362 481 km
- 07** 15:00 **Uranus at Opposition** (mag 5.8)
- 08** 05:51 **Full Moon** rises 6:19 pm Oct 7 "Hunter's Moon"
05:55 **Total Lunar Eclipse**; see Special Events below
- 12** 04:58 Aldebaran 1.4°S of Moon
- 15** 14:12 **LQ Moon** rises locally at 11:28 pm DST
- 16** 16:00 Mercury Inferior Conjunction (in front of Sun, not vis.)
- 17** 22:25 Jupiter 5.4°N of Moon
- 18** 01:05 Moon at Apogee: 404 898 km
21:08 Regulus 4.7°N of Moon
- 21** 11:00 **Orionid Meteor Shower** 20/h Moon 5%
- 23** 16:45 **Partial Solar Eclipse**; see Special Events below
16:57 **New Moon** rises locally at 7:18 am DST
- 25** 02:00 Venus at Superior Conjunction (behind Sun, not vis.)
11:04 Saturn 1.0° S of Moon: Occn.(not vis locally)
- 30** 21:48 **FQ Moon** rises locally at 1:53 pm DST

BAS Events

- Oct 1** Wed **BAS meeting** Grey Roots Museum 7 pm speaker: **Mike Tettenborn** Meteorites
- Oct 4** Sat (FQ+3) **OSFN star tour/talk** ES Fox 7:00 pm
Leader: John H.(alt. date Oct 18 LQ+3)
- Oct 8** Wed (FM) **2nd Lunar Eclipse of 2014** viewing from 6th ST N washrooms at Sauble Beach. Umbral contact 5:14 am DST Oct 8, total phase from 6:25 am to 7:24 am DST Oct 8. Last umbral contact at 8:34 am DST. Moon sets 7:37 am Oct 8.
- Oct 21** Tue (NM-2) **Orionid meteors**, 20/h peak at noon Oct 21, Moon only 5% observe Oct 20 & Oct 21 evenings
- Oct 23** Thu (NM) **Partial Solar Eclipse** first half only visible from Bruce-Grey, viewing from 6th St N washrooms Sauble Beach then viewing at ES Fox @dark. First contact 5:36 pm DST, Sun sets at 6:26 pm DST. Mid-eclipse is about 13 minutes later but Sun is below our horizon.

Special Events

Two Eclipses

Oct 8: Total Lunar Eclipse: The second of the two 2014 lunar eclipses occurs in the morning hours of Oct 8. From Bruce and Grey we will see about half of the entire event because the Moon sets locally at 7:37 am Oct 8 and there is still an hour of umbral shadow to view. Viewers west of Minnesota/Manitoba longitudes will see the entire event. Times for local viewing are given in the BAS Events listing for Oct 8.

Oct 23: Partial Solar Eclipse: This eclipse is almost a duplicate of the May 20, 2012 annular solar eclipse which was partial locally. Again, for us in Bruce/Grey, the Sun will set in eclipse with a good chunk covered by the Moon. A consolation for those stuck here is that there is nowhere on the Earth where a total obscuration will occur -the best is up in the Arctic with about 80%.



Sun coverage by the Moon on Oct 23 reaches maximum for Bruce/Grey at 6:33, just a few minutes after sunset. Diagram above is for 6:21 pm DST. Venus is the "star" at upper right.

Planets

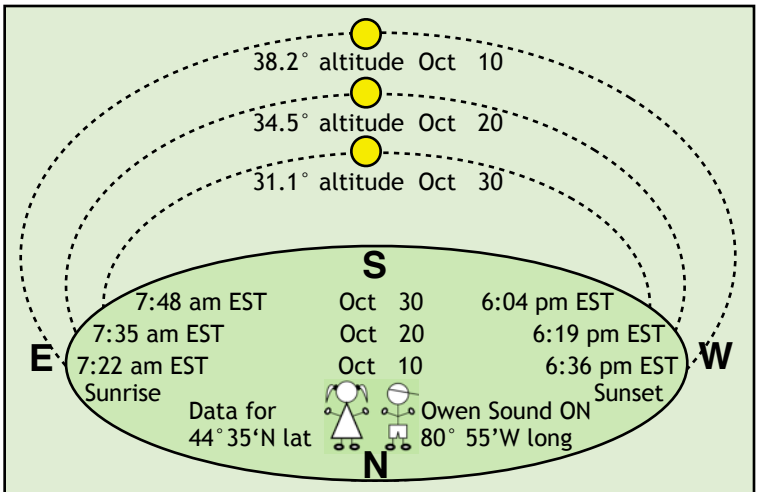
MERCURY, is poorly placed for viewing in Oct as it quickly drops back toward the Sun. It passes between us and the Sun in mid-month.

VENUS, is also drawing close to the Sun in October, passes behind it late this month and is thus not visible. **MARS** (mag. 0.8) tracks eastward in the evening sky across Scorpius and into Sagittarius in October. Look for it near the Lagoon Nebula M8 on Oct 27.

JUPITER, (-2.0) is rising in the east around midnight and will rise an hour earlier by month-end. **SATURN**, (mag. 0.5) is low the western horizon at sunset and by the end of October sets only an hour after the Sun does. Saturn observing is pretty much over. **URANUS**, (5.8) and **NEPTUNE**, (7.8) rise shortly after sunset this month and are in good viewing position all October. Uranus reaches opposition on Oct 1. Both **asteroid, Vesta (7.1)** and dwarf planet, **Ceres (8.3)** are low in the evening sky between Mars and Saturn. They set only two hours after sunset so their viewing season is drawing to a close. Charts available on the BAS website. **PLUTO** (mag. 14) is above the western horizon and sets by 9 pm locally. Pluto 2014 charts are also found on the BAS website.

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

The October moon phase graphic below shows lunar phases for each night of the month. Times of moonrise for NM, FQ, FM and LQ are given in the Calendar listing at left.



Oct 2014

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

BAS Member Loaner Scopes

Solar H-alpha scope now out on loan.

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

One 12-inch Dob available.

Only one 12-inch loaner telescope is available for the summer. (The other is at Lion's Head "POD") Two of our two 8-inch dobsonians are presently out on loan. Contact Brett T. or Aaron T. for on availability. Scopes come in periodically so keep checking with Brett or Aaron if you are interested in a loaner.



SGN Classified Ads Section

(Now also on our website)

FOR SALE: Televue Pronto Price reduced to \$600 !

2 element E.D. Refractor, 2.7" / 70mm diameter. f.l. 480mm, f/6.8. with 1-1/4" Star Diagonal, with 45 degree Prism diagonal (for terrestrial viewing), with TeleVue Red dot finder, complete with TeleVue Soft Case. Asking \$600.-- Contact Anton VanDijk 519 376-9912 ravand@rogers.com



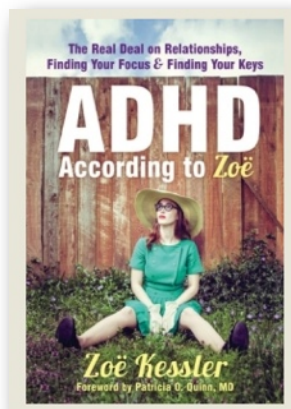
For Your reading Pleasure/Enlightenment:



Humane Physics

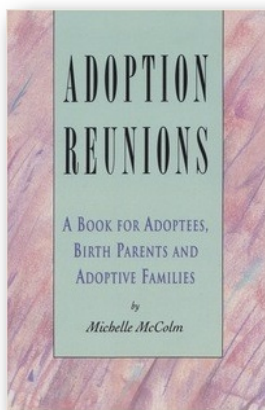
Physicist Francis Mont has published the first of two volumes on the history of Physics and has a book store just south of Chatsworth. Contact Francis directly for a copy or go to www.montland.ca

ADHD According to Zoë and Adoption Reunions



Other works by the same author include **Adoption Reunions**, now in its 21st year in print.

See www.zoekessler.com for more or contact her directly for a copy.



The Cartoon Corner

<http://imabubble.deviantart.com/>

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Discover the Universe is an Astronomy Workshop that is offered free of charge to anyone interested especially astronomy enthusiasts and teachers. Details can be found here: <http://www.discovertheuniverse.ca/> and the webinars require only a registration to join in. The next webinar is being hosted by **Alan Dyer on October 6th**. Don't miss it.

