Star Gazer News

Astronomy News for Bluewater Stargazers
Vol 8 No.1 Jan 2014

Jan 2014 Contents

Interesting 2014 Viewing Events

Jan 3 Quadrantids (poor); **Jan 26 Graze of v-Sco (spectacular!)** visible from near ES Fox (see pg 4) below.

Feb: Planetary grouping with Saturn, Spica, Mars, Moon Feb 14

Mar 1 Messier Marathon; **Mar 20 Occultation of Regulus by Erigone** -a drop in brightness of 10 magnitudes!

Apr 15 Total Lunar Eclipse (a good one!); Apr 29, annular Solar Eclipse visible as partial in Australia and annular in Antarctica only

May 5 to 11: Astronomy Week; **May 24 NEW meteor shower** from Camelopardalis with possible 100-400 /h, maybe more!

Jun 4: K-W Telescopes Webinar first of two this year (also in Sep)

Jul 18-20 (tentatively) Dark Sky Weekend BPNP; Kids Astronomy Camp July 28-Aug 1 assuming numbers warrant

Aug 21-24: Starfest; Perseids Aug 12 (FM+2) and Summer Stargazing of some kind to be decided.

Sep 17 is the 3rd Anniversary of ES Fox Observatory

Oct 8: 2nd Lunar Eclipse (we see first half only then moon sets); Oct 23 Partial Solar Eclipse; Oct 25 Harvest Dinner #5

Nov 17 Leonid meteor shower might be good (20/h, waning moon)

Dec 13/14 Geminid meteors, good conditions before moonrise around midnight.

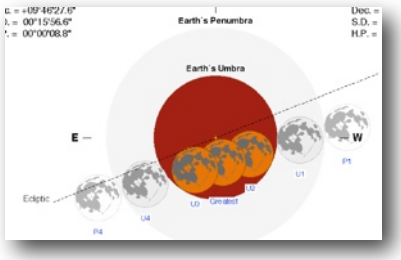
NGC 253 *Paul Zelichowski image above shows the Sculptor Galaxy through a 10 inch f/4.5 Newtonian, SXVH9C camera taken in October, 2006, about 60 minutes of exposure.*

As one of the brightest galaxies in the sky, the Sculptor Galaxy is viewable through binoculars. It is considered to be one of the most easily viewed galaxies in the sky after the Andromeda Galaxy. NGC 253 is highest in northern hemisphere skies in December but still visible in the SW in January.

The Sculptor Galaxy is a good target for 12-inch (300 mm) or larger telescopes, but even a 6-inch scope will show details. It appears as a galaxy with a long, oval bulge and a mottled disk. Although the bulge appears only slightly brighter than the rest of the galaxy, it is fairly extended compared to the disk. In 16-inch (400 mm) scopes and larger, a dark dust lane northwest of the nucleus is visible, and over a dozen faint stars may be seen superimposed on the bulge. [-the previous from Wikipedia; see more on Sculptor on p.11 -ed]

Looking Ahead: 2014 Eclipses

After a couple of poor years for **lunar eclipses**, 2014 bounces back with two, one very good one and a second where the Moon sets while in totality. There is also a **partial solar eclipse** that will remind many of the May 20, 2012 partial solar that we observed along with a big crowd from the beach at Southampton.



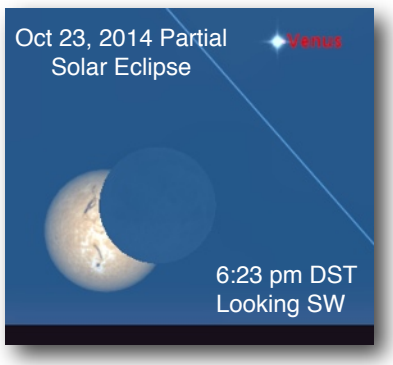
Apr 15, 2014 Lunar Eclipse

Three of the 4 eclipses visible in 2014 are described below. The fourth is an annular solar eclipse over Antarctica that will be difficult to observe. More info to come in SGN for March and September.

Apr 15: Total Lunar Eclipse, visible in its entirety (1:58 am to 5:33 am DST) from Bruce-Grey.

Oct 8: Total Lunar Eclipse, visible up to moonset in the West while still in total phase.

Oct 23: Partial Solar Eclipse, visible locally but never total anywhere, at best 81% coverage. View from Lake Huron shore again is recommended. Diagram right.



BAS Executive 2013-2015

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BAS Events for January 2014

NOTE: BAS does not meet in January or February due to the generally poor winter driving conditions. Our next regular meeting takes place at the Grey Roots Museum at the usual time on March 5, 2014.

However, impromptu viewings still go on at the Fox Observatory as weather permits. Regular members receive notifications of these (usually fairly short notice) as they occur. If you are not a regular member and are not on the notification email list please send a short note to John, Aaron or Brett at one of the emails listed in the BAS Executive box above.

BAS executive for 2013 to 2015 is:

President: Aaron Top
Vice-President: John Hlynialuk
Secretary: Lorraine Rodgers
Treasurer: Cheryl Dawson
Past-President: Brett Tatton
Past-Past President: Dan Gieruszak
Membership Chair: Dave Skelton

From the "Top" by Aaron Top, President, BAS

Hey , I hope everyone is enjoying the cold weather.... NOT! I personally dislike the cold very much, however, the beautiful clear sky the other night (even though the moon was full) was worth getting out to snap a few shots and enjoy some of those bright winter stars that the clouds have been shrouding over the last few weeks. Jupiter reaches its opposition on January 5, 2014 when it will rise as the sun sets and be out all night reaching the Zenith midway through the night. Enjoy -Aaron

Astronomical Events Jan 2014

Jan 1 Wed (NM) **Ring in the NEW YEAR!**

Jan 3 Fri (NM+2) **Quadrantid Meteors** peak 3 pm,120/h. Peak very narrow, moon is a crescent

Jan 5 Sun (FQ-2) **Jupiter at opposition** - bright and visible all night. Prime Jupiter viewing!

Jan 26 Sun (LQ+2) **Spectacular Graze of ν-Scorpii**, 4th mag **quadruple** star -track right over Fox -see p4

Jan 28/29 (NM-1) **Venus and thin crescent Moon** in East before sunrise, a nice celestial grouping.

Jan 30 Thu (NM) Second **New Moon** this month -absolutely no importance.

Jan 31 Fri (NM+1 **Mercury** farthest separation from Sun after sunset. (18.4°) magnitude -0.5. Near 1-day old crescent Moon in West after sunset,a chance to see a young Moon.

Another "Blue Marble" shot:
A nice fish-eye shot compliments of Aaron taken Dec 15, 2013. Image was 25 s taken with a Canon 50D using a 5.0 mm focal length fish-eye lens at f/5 ISO 800. [Now we know where Aaron lives!]

The almost full moon is the obvious central object but have a look for Jupiter and several of the stars of the Winter Hexagon.

January Comet Update

I have often called 2013 the **"Year of the Comets"** (yes plural!) and quite rightly so. Early on, Comet PanSTARRS reached better than 5th magnitude in our sky. Shortly thereafter, Comet Lemmon brightened to about the same level. And while we all waited impatiently for Comet ISON to reach naked eye visibility, (it did eventually as it neared the sun) Comet Lovejoy snuck up on us and is still shining at magnitude 4 as I write this article. And while ISON has disappeared after its close approach to the Sun, Comet Lovejoy is shining away quite high in the sky well before dawn and visible in binoculars. An image I took of it on Nov 25 showed a short tail and even a short 6 s exposure on Dec 3, showed a longer 0.5° tail. it is now spectacular! See Spaceweather.com for Dec 18 for an image showing a tail over 7° long. Other reports give 20°!

So there has been no shortage of naked eye/binocular comets -we still have some comet-watching to do in 2014.

Here are the predictions for comet viewing into January of 2014. More detail like light curves and recent images are provided at this site: *http://www.aerith.net/index.html*. The summary below is based on the information provided there by Japanese comet specialist Seiichi Yoshida. Look in his "Weekly Information About Bright Comets" for a complete list.

Comet Lovejoy (C2013R1) may drop below 5th magnitude by the end of December but will still be visible for another month or two at magnitudes above 10, perhaps even 8 or 9. We have a prolonged period of viewing of Lovejoy as it slowly traverses the lower part of Hercules and top of Ophiuchus in Jan and Feb. It is well placed in the sky rising around 3 am in Jan and into Feb. Even in late Jan, it is 30° above the horizon by dawn. Lots of dark hours to do your viewing and imaging. Finder chart at upper right.

Comet LINEAR (C2012 X1) which erupted much like Comet Holmes did in 2007, is expected to return to its regular rate of brightening which would have seen it become a 12th magnitude object in mid-Feb. The cloud that was shining at magnitude 8 is expected to dissipate and a more normal light curve may be apparent. However, in erupting unexpectedly as it did, LINEAR demonstrated the famous comet unpredictability. The return to a normal light curve is still just a prediction. LINEAR bears watching.

Comet Encke (2P/Encke) is unfortunately very close to the sun presently and will stay in the bright solar glare for the rest of the winter. By spring when it would be better placed, it will fade to 15th magnitude or fainter and be on its outward journey back into deep space. November last year was Encke's best time and we will have to wait until March 2017 for its return to visibility from Earth. Encke, by the way is the shortest period comet known and is a regular visitor to the inner solar system but it spends a lot time out near the orbit of Jupiter.

Comet Nevski (2013 V2) is an evening comet visible in the NE sky at 8 pm and is around 10 magnitude now (with some estimates of 9.) It is not expected to get much brighter over the next month. Nevski is in the northern sky in UMa heading towards the bowl of the Big Dipper. Both Nevski and Brewington (below) are faint, diffuse and tailless.

Comet Brewington (154/P) is also an evening sky comet has a similar brightness as Nevski. It is located in the Great Square of Pegasus at the start of Jan. Charts for both are available on the BAS website.

Comet Lovejoy Still Visible

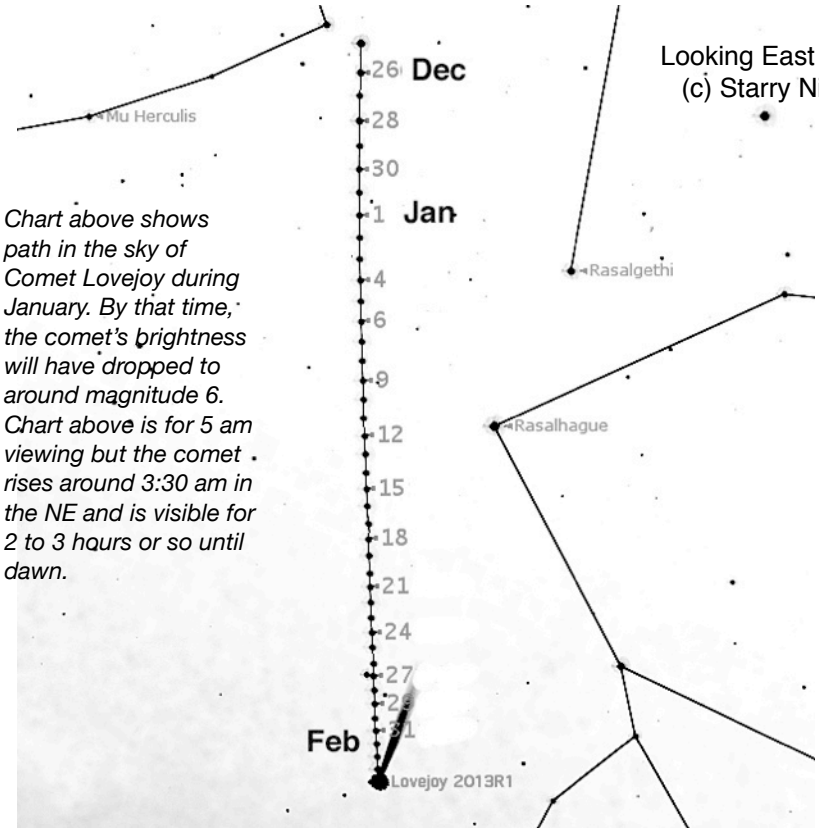


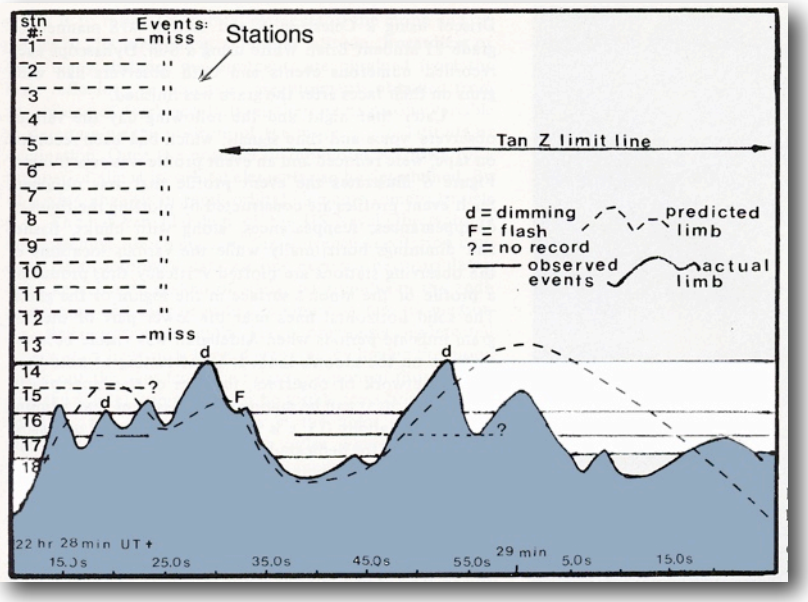
Chart above shows path in the sky of Comet Lovejoy during January. By that time, the comet's brightness will have dropped to around magnitude 6. Chart above is for 5 am viewing but the comet rises around 3:30 am in the NE and is visible for 2 to 3 hours or so until dawn.

Damian Peach Image of Lovejoy below taken Dec 10, 2013

Spectacular Graze of v-Scorpii Right in Our Own Backyard

On Jan 26 around 5:25 am EST, the lower limb of the crescent moon skims past the quadruple star system v-Sco (Jabbah) in what is called a grazing occultation. Jabbah is sometimes called the other "Double-Double" because its 4 components pair up like the famous Lyra quartet. Two stars, mag. 4.4 and 5.3 form one pair separated by 1.3" and 41" away is the other fainter pair with mag. 6.6 and 7.2 separated by 2.4" of arc (according to Cambridge Double Star Atlas). The graze starts at 5:25 am and last for about 3 minutes while the moon slides past Jabbah, occulting the fainter pair first and then the brighter. The neatest part of this is that since the moon is not a perfect sphere, the star or stars may appear in valleys and disappear behind mountains, blinking on or off instantaneously. The track where these events occur crosses the peninsula only a few km south of the observatory and heads towards Owen Sound. Anyone along that line will see variations in the disappearances and re-appearances so location is critical. An error of a few hundred metres can make a difference. Using the lat/long for ES Fox, Starry Night shows one of the pairs occulted by the moon and the other (brighter) pair just skimming the moon's limb. The observing location north or south of the line is important in determining what actually happens. Since grazes for this part of the world always have a correction for altitude, south of the line is better than north.

The article at right is David Dunham's summary of gazing occultations if you need more information. Also on our website, I have posted a link (see USEFUL LINKS) to an article that Doug C and I did years ago describing the most spectacular graze I have never (sic) seen. (Doug did, but read the article). The graphic below is from that article.



The lunar profile final results from a Dec 1979 graze of Aldebaran that occurred near Gould Lake, just south of the present Fox Observatory. See BAS website for a link to the original article (D. Cunnigham and J. Hlynialuk, authors) that appeared in The Physics Teacher Apr 1983 issue.

Observe From Fox Observatory

It looks like the most convenient spot to observe this event is the Fox Observatory and so we will make an attempt to watch the 5:00 am event there on that morning. Let me (John H.) or Aaron T. know that you are interested by phone or email. We will be sending out a general email when weather closer to the event is more predictable. Keep you fingers crossed for clear morning skies!

An Introduction to Grazing Occultations

As the Moon moves through the sky, it passes in front of, or occults, stars in its path. For most observers within the region of visibility of the occultation, the event (time from star's disappearance until its reappearance at the opposite edge of the Moon) will last a little more than an hour. North or south of the region of visibility of the occultation, the Moon will be seen to miss the star, passing close to it. Within a mile or two of the northern or southern boundary, or limit, of the region, a grazing occultation can be seen. Here the star will appear to pass along a line just touching (or tangent to) the edge of the Moon, and the star will disappear and reappear among the mountains and valleys along the Moon's edge for a period of a few minutes. Such a grazing occultation is a spectacular sight; at no other time, except perhaps during a solar eclipse, is the Moon's motion more apparent.

A grazing occultation is visible from a zone about usually about two miles wide, depending on the lunar topography, which can be predicted approximately from lunar charts. If several observers with telescopes and timing equipment are positioned at intervals across the zone, they can each time the sequence of disappearances and reappearances as seen from their location. If the positions of the observing locations are measured, the timings can be reduced afterwards to determine details of the lunar profile, and gives a very accurate fix of the position of the Moon relative to the star. Such observations improve parameters such as the tilt of the Earth's equator, the rotation of the Milky Way galaxy, total solar eclipse timing and, if the star's disappearances or reappearances occurs in steps, it may indicate a previously-unknown double star.

The location of the telescope should be described to an accuracy of about ten feet relative to landmarks (road intersections or large buildings) that are shown on the detailed topographic map of the area; the latitudes and longitudes of the observation sites can then be measured from the map by the expedition leader. Timings can be made by calling out the successive events (you can use "D" for disappearance or "R" for reappearance; some are more comfortable thinking the star as a light that goes "off" and "on") and also tape recording a radio station. The best is to record the shortwave time signals from station WWV at 5.0, 10.0, or 15.0 megahertz.

Camcorders are now almost as common as tape recorders and can be used in this case as tape recorders; the video is not needed. There are ways to hook sensitive video cameras to telescopes, but this is more advanced work. Visual timings made to an accuracy of half a second are quite adequate for defining the lunar profile; for a graze, the observer's location is more sensitive than the timings, since observers even 50 feet apart will notice differences in their event timings.

Making the observations is not that difficult. Besides observing the event, all you need is a tape recorder or camcorder to record call-outs of the events, plus a background time reference, which could be an agreed-upon local AM or FM radio station. It's more satisfying to even new observers to both observe a graze, and record it for comparison with records at adjacent sites to build up the profile, whose detail and accuracy is proportional to the number of stations recording data.

David W. Dunham, IOTA, 1996 April
e-mail: dunham@starpower.net

Submitted by Karl Battams on Mon, 12/02/2013 - 08:32

Comet C/2012 S1 (ISON)

***Born** 4.5 Billion BC,*
***Fragmented** Nov 28, 2013 (age 4.5-billion yrs old)*

Born in a dusty and turbulent environment, comet ISON spent its early years being jostled and struck by siblings both large and small.

Surviving a particularly violent first few million years, ISON retreated to the Oort Cloud, where it maintained a largely reclusive existence for nearly four billion years. But around 3-million B.C., a chance encounter with a passing star coerced ISON into undertaking a pioneering career as a Sungrazer. On September 21, 2012, ISON made itself known to us, and allowed us to catalog the most extraordinary part of its spectacular vocational calling.

Never one to follow convention, ISON lived a dynamic and unpredictable life, alternating between periods of quiet reflection and violent outburst. However, its toughened exterior belied a complex and delicate inner working that only now we are just beginning to understand. In late 2013, Comet ISON demonstrated not only its true beauty but a surprising turn of speed as it reached its career defining moment in the inner solar system. Tragically, on November 28, 2013, ISON's tenacious ambition outweighed its ability, and our shining green candle in the solar wind began to burn out.

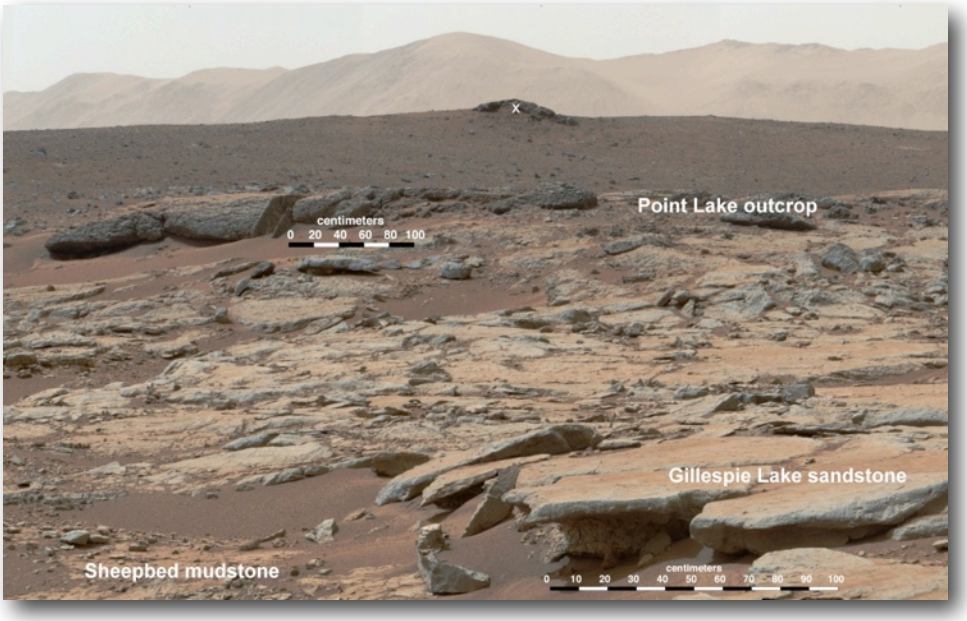
Survived by approximately several trillion siblings, Comet ISON leaves behind an unprecedented legacy for astronomers, and the eternal gratitude of an enthralled global audience. In ISON's memory, donations are encouraged to your local astronomy club, observatory or charity that supports STEM and science outreach programs for children.

This is how Comet ISON wished to be remembered. Image by Damian Peach
Nov 15, 2013 0.11m F5.6. STL-11k camera. LRGB: L: 5x2mins. RGB: 1x2mins.

http://www.damianpeach.com/ison.htmhttp://www.damianpeach.com/ison.htm

Curiosity Discovers Ancient Mars Lake Could Support Life

by KEN KREMER *on* DECEMBER 9, 2013 Universe Today



Outcrops in Yellowknife Bay are being exposed by wind driven erosion. These rocks record superimposed ancient lake and stream deposits that offered past environmental conditions favorable for microbial life. This image mosaic from the Mast Camera instrument on NASA's Curiosity Mars rover shows a series of sedimentary deposits in the Glenelg area of Gale Crater, from a perspective in Yellowknife Bay looking toward west-northwest. The "Cumberland" rock that the rover drilled for a sample of the Sheepbed mudstone deposit (at lower left in this scene) has been exposed at the surface for only about 80 million years. Credit: NASA/JPL-Caltech/MSSS

NASA's Curiosity rover has discovered evidence that an ancient Martian lake had the right chemical ingredients that could have sustained microbial life forms for long periods of time – and that these habitable conditions persisted on the Red Planet until a more recent epoch than previously thought.

Furthermore researchers have developed a novel technique allowing Curiosity to accurately date Martian rocks for the first time ever – rather than having to rely on educated guesses based on counting craters.

All that and more stems from science results just announced by members of the rover science team.

Researchers outlined their remarkable findings in a series of six new scientific papers published today (Dec. 9) in the highly respected journal Science and at talks held today at the Fall 2013 Annual Meeting of the American Geophysical Union (AGU) in San Francisco.

The Curiosity team also revealed that an investigation of natural Martian erosion processes could be used to direct the rover to spots with a higher likelihood of holding preserved evidence for the building blocks of past life – if it ever existed.

The ancient fresh water lake at the Yellowknife Bay area inside the Gale Crater landing site explored earlier this year by Curiosity existed for periods spanning perhaps millions to tens of millions of years in length – before eventually evaporating completely after Mars lost its thick atmosphere.

Furthermore the lake may have existed until as recently as 3.7 Billion years ago, much later than researchers expected which means that life had a longer and better chance of gaining a foothold on the Red Planet before it was transformed into its current cold, arid state.

Researchers also announced that they are shifting the missions focus from searching for habitable environments to searching for organic molecules – the building blocks of all life as we know it.

Why the shift? Because the team believes they have found a way to increase the chance of finding organics preserved in the sedimentary rock layers.

"Really what we're doing is turning the corner from a mission that is dedicated to the search for habitable environments to a mission that is now dedicated to the search for that subset of habitable environments which also preserves organic carbon," Curiosity Principal Investigator John Grotzinger, of the California Institute of Technology in Pasadena, said at an AGU press conference today.

"That's the step we need to take as we explore for evidence of life on Mars."

Earlier this year, Curiosity drilled into a pair of sedimentary Martian mudstone rock outcrops at Yellowknife Bay known as "John Klein" and "Cumberland" – for the first time in history.

Grotzinger said the ancient lake at Yellowknife Bay was likely about 30 miles long and 3 miles wide.

Powdered samples deposited into the rovers miniaturized chemistry labs – SAM and CheMin – revealed the presence of significant levels of phyllosilicate clay minerals.

These clay minerals form in neutral pH water that is 'drinkable" and conducive to the formation of life.

"Curiosity discovered that the fine-grained sedimentary rocks preserve evidence of an environment that would have been suited to support a Martian biosphere founded on chemolithoautotrophy," according to one of the science papers co-authored by Grotzinger.

"This aqueous environment was characterized by neutral pH, low salinity, and variable redox states of both iron and sulfur species."

The rover has detected key elements required for life including carbon, hydrogen, oxygen, sulfur nitrogen and phosphorous.

The team is still looking for signatures of organic molecules.

Right now the researchers are driving Curiosity along a 6 mile path to the base of Mount Sharp -the primary mission destination – which they hope to reach sometime in Spring 2014.

But along the way they hope to stop at a spot where wind has eroded the sedimentary rocks just recently enough to expose an area that may still preserve evidence for organic molecules – since it hasn't been bombarded by destructive cosmic radiation for billions of years.

Read more: http://www.universetoday.com/107013/curiosity-discovers-ancient-mars-lake-could-support-life/#ixzz2n5hoRarN

Dr. Ken Kremer is a speaker, scientist, freelance science journalist (Princeton, NJ) and photographer whose articles, space exploration images and Mars mosaics have appeared in magazines, books, websites and calanders including Astronomy Picture of the Day and the covers of Aviation Week & Space Technology, Spaceflight and the Explorers Club magazines. Ken has presented at numerous venues and has reported first hand from the Kennedy Space Center and lectures on both Human and Robotic spaceflight - www.kenkremer.com

A New Year's Resolution- Seeking New Adventures

"... pushing out into the unknown in obedience to an inward voice
to an impulse beating in the blood, to a dream of the future."
"Lord Jim" by Joseph Conrad recounted by Christopher Benfey
in his review of "The Age of Wonder" by Richard Holmes

Life experiences for my wife, Paula, and myself, have rarely been scripted. We have moved through life together, for almost 50 years now, savouring the wonders of the natural world and enjoying the personalities of the fascinating people we happen to meet. I have lost count of the number of times our lives have travelled unintended routes. This experiential variety helps to keep the "psychological rut" far away and has made this life journey interesting and very worthwhile for both of us. But there is no "one-size-fits-all" prescription to bring enthusiasm back into your life. One of my high school classmates went on to become a dentist and he rarely took a single, once-a-year vacation; instead, he and his wife regularly took a mini-vacation for a few days and that seemed to recharge their batteries. For us, traveling is a key component of that prescription.

In 2006, Paula and I travelled to Turkey with veteran eclipse chaser, Don Hladiuk, to view the March 29th total solar eclipse. BCAS members, Dave and Joan Skelton, along with Charlie and Shiela Szabototh, joined us on that trip while John Hlynialuk made his own arrangements and experienced the same eclipse. We set up at on the shores of the Aegean, near Side, and had a perfect setting for this wonder of nature. The next day, when our group travelled to Istanbul, Paula and I headed, instead, to the Island of Rhodes for a two-week self-guided excursion. We choose not to rent a car but relied on public transportation for this adventure.

Cosmologist Dr. Romeel Dave and his wife, Cultural Astronomer Dr. Jarita Holbrook
Photo by Doug Cunningham taken on a bus trip between Lindos and Rhodes Town, Island of Rhodes

Rhodes is a fascinating place and steeped in history. If you ever find yourself in Rhodes, with a couple of days to spare, then you must visit the cliffside village of Lindos, located about 50 km from Rhodes Town. The natural setting is picture perfect! To the right of the town's whitewashed buildings is the Temple of Athena with an Acropolis rising 400 ft above the town. The cafes, art galleries, and shops frame a beautifully protected harbor and sand beach. We liked Lindos so much we visited it twice.

On our second visit, when we returned to Rhodes Town later in the day, we were joined at the back of the bus by a young couple, with a small child. Paula struck up a conversation with the wife, Dr. Jarita Holbrook. It turned out that they were both astronomers and had come to Rhodes for an International Conference on Cultural Astronomy, which Jarita had organized. Her husband was Romeel Dave, a computational cosmologist , who uses large-scale hydrodynamic simulations to understand how the observable Universe evolves from the Big Bang origin until today. At the time, he was working at the University of Arizona's Steward Observatory on Kitt Peak, but, this year, he is the South African Research Chair in Cosmology, using Multi-wavelength Surveys.

Lindos, Island of Rhodes, Greece, Wikipedia Photo

During the bus ride, from Lindos to Rhodes Town, Romeel discussed his research and cosmology. For me, as we talked, time stood still! As Paula and I said goodbye at the bus station, Romeel turned to me and said, " *For someone who has been an observational astronomer for all these years you might wish to move beyond sightseeing and actually do some research*." That was a neat idea, but not new to me. I had previously been active in observing cataclysmic variable stars for the AAVSO (like SS Cygni and U Geminorum) and timing lunar grazing occultations with my students for IOTA. But now, I was at the stage in my astronomy development, where employing new equipment, learning new processing techniques, and investigating a new area of astronomy appealed to me. I would always enjoy observing the wonders of the Universe first hand; but, getting involved in something new would be fun! Well, that unexpected meeting with Romeel and Jarita provided just the catalyst that Paula and I needed to enlarge our Quetican Observatory. I said to Paula, "*You know that money we have saved, would you mind if I expanded Quetican*?" Paula said, "*Good idea, Christy's education is finished, and now, I could have my own observatory*." You can see the resulting twin dome observatory in the masthead photo upper right.

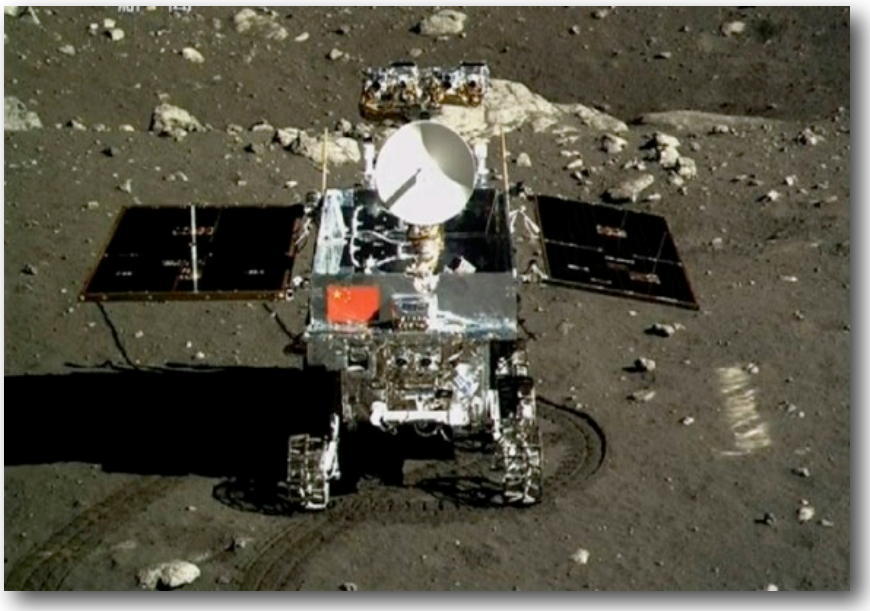
Tony Hallas with his Astro-Imaging Equipment
Web Archive Image

A chance meeting with Romeel and Jarita, and another road had opened in our life's astronomy journey. We all have to guard against getting stale; becoming caught in a psychological rut. It happens to the best of us. Periodically, we have to seek new horizons, new roads. I was again reminded of this when I read Tony Hallas's "Cosmic Imaging" column in the February, 2014, issue of Astronomy magazine. Tony has been writing his column for the past 3 years and he has provided many helpful astro-imaging processing tips. I loved reading them, and I would remove them from the magazine and keep them in a special binder. But now a revelation, his column this month would be his last! In the column Tony observed that, over the years, many successful astro-imagers would leave the avocation, perhaps bored with the same old thing.... another galaxy .. ho-hum. Apparently, he needed a new adventure. In his words, it was now time for him to "***re-tool and re-invent***" himself.

He suggested two ways, as an astrophotographer, he might accomplish his re-invention, and perhaps, he could do both at the same time. First, he could invest in new optics and imaging equipment that will further his capabilities. Secondly, he could study new software and embrace new techniques to improve his processing skills. He explained that, with his lectures and column writing, he has been in hibernation mode, stalled, and his equipment had not kept pace with his increasing imaging knowledge. So, Tony has purchased a rich field refractor, a Takahashi TOA 130, and installed it at his dark sky site in northeastern California. He says, "***You are only as good as your last shot***". Tony now has more time, a superb refractor, and a genuine desire to push the imaging envelope. Hopefully, this new direction will provide the challenge and satisfaction he seeks. If his past talent and quality imaging are any guide, all astro-imagers will benefit from his new journey. Like Tony, we all need new challenges, new interests, new horizons. Happy 2014!

China Lands Rover on Moon

Read more: http://www.universetoday.com/107226/chinese-rover-lander-beam-back-selfies-with-chinas-flag-shining-on-moons-surface/#ixzz2nkvl4R7z



China's ambitious lunar space exploration program achieved another stunning success Sunday night, Dec 15, when the countries inaugural Chang'e-3 lunar lander and rover beamed back portraits of one another snapped from the Moon's surface –that also proudly displayed the brilliant red Chinese national flag shining atop an extraterrestrial body for the very first time in human history.

"I announce the complete success of the Chang'e-3 mission," said Ma Xingrui, chief commander of China's lunar program, during a live CCTV broadcast from mission control at the Beijing Aerospace Control Center (BACC) in Beijing, where Chinese President Xi Jinping was present.

A wave of cheers and high fives rocked around mission control as the startling imagery of the 'Yutu' rover and Chang'e-3 lander [which touched down] in the Bay of Rainbows was received around 11:42 p.m. Sunday, local Beijing time, via China's own deep space tracking network.

China thus became only the 3rd country in the world to successfully soft land a spacecraft on Earth's nearest neighbor after the United States and the Soviet Union.

China's 'Yutu' rover rolled majestically onto the Moon's soil on Sunday, Dec. 15, at 4:35 a.m. Beijing local time – barely seven hours after the Chang'e-3 mothership touched down atop the lava filled plains of the Bay of Rainbows on Dec. 14.

The rover's wheels left behind noticeable tire tracks as it drove across the loose lunar topsoil. [from Universe Today www.universetoday.com]

Second Monkey Travels Safely To Space And Back, Iran Reports

by Elizabeth Howell Dec 16, 2013 Universe Today

[A} Shot from Iran state media of Fargam, a monkey who reportedly travelled to space in December 2013. Credit: newsdailyable (YouTube screenshot)

Read more: http://www.universetoday.com/107237/second-monkey-travels-safely-to-space-and-back-iran-reports/#ixzz2o2By6nuj

Reports from the Islamic Republic News Agency said the ballistic flight [that launched Fargam, the space monkey] reached as high as 75 miles (120 kilometers). That's just beyond the Karman line of 62 miles (100 kilometers) that many authorities cite as the boundary of space.

"The President said that thank God, Iranian astronauts launched into the space the second monkey, Fargam, on the first day of the Week of Research, the 'Pajouhesh' explorer and landed in full safety and health," read a dispatch on IRNA, which is the official state [news] agency in Iran.

The launch has not been verified outside of Iran. In January, the country announced the launch of a first monkey, Pishgam (which means "Pioneer" in Farsi).

The United States, Soviet Union and France sent primates themselves into space in the 1960s, many of which did not survive the trip. "Ham" is among the most famous monkey space voyagers; the U.S. chimp launched into space and landed safely on Jan. 31, 1961, a few months before astronaut Al Shepard became the first American person in space that May.

Hubble Space Telescope Sees Evidence of Water Vapor Venting off Jupiter Moon

Dec. 12, 2013 NASA News Release

NASA's Hubble Space Telescope has observed water vapor above the frigid south polar region of Jupiter's moon Europa, providing the first strong evidence of water plumes erupting off the moon's surface.

Previous scientific findings from other sources already point to the existence of an ocean located under Europa's icy crust. Researchers are not yet fully certain whether the detected water vapor is generated by erupting water plumes on the surface, but they are confident this is the most likely explanation.

Should further observations support the finding, this would make Europa the second moon in the solar system known to have water vapor plumes. The findings are being published in the Dec. 12 online issue of Science Express, and reported at the meeting of the American Geophysical Union in San Francisco.

"By far the simplest explanation for this water vapor is that it erupted from plumes on the surface of Europa," said lead author Lorenz Roth of Southwest Research Institute in San Antonio. "If those plumes are connected with the subsurface water ocean we are confident exists under Europa's crust, then this means that future investigations can directly investigate the chemical makeup of Europa's potentially habitable environment without drilling through layers of ice. And that is tremendously exciting."

In 2005, NASA's Cassini orbiter detected jets of water vapor and dust spewing off the surface of Saturn's moon Enceladus. Although ice and dust particles have subsequently been found in the Enceladus plumes, only water vapor gases have been measured at Europa so far.

Hubble spectroscopic observations provided the evidence for Europa plumes in December 2012. Time sampling of Europa's auroral emissions measured by Hubble's imaging spectrograph enabled the researchers to distinguish between features created by charged particles from Jupiter's magnetic bubble and plumes from Europa's surface, and also to rule out more exotic explanations such as serendipitously observing a rare meteorite impact.

The imaging spectrograph detected faint ultraviolet light from an aurora, powered by Jupiter's intense magnetic field, near the moon's south pole. Excited atomic oxygen and hydrogen produce a variable auroral glow and leave a telltale sign that are the products of water molecules being broken apart by electrons along magnetic field lines.

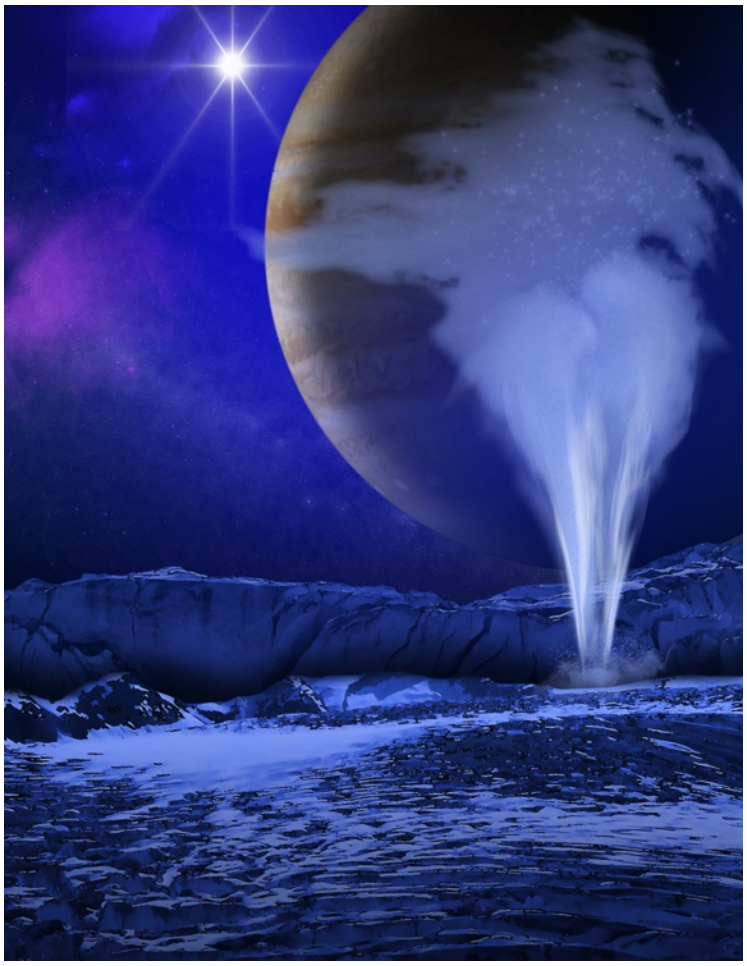
"We pushed Hubble to its limits to see this very faint emission. These could be stealth plumes, because they might be tenuous and difficult to observe in the visible light," said Joachim Saur of the University of Cologne, Germany. Saur, who is principal investigator of the Hubble observation campaign, co-wrote the paper with Roth.

Roth suggested that long cracks on Europa's surface, known as lineae, might be venting water vapor into space. Cassini has seen similar fissures that host the Enceladus jets.

Also the Hubble team found that the intensity of the Europa plumes, like those at Enceladus, varies with Europa's orbital position. Active jets have only been seen when the moon is farthest from Jupiter. The researchers could not detect any sign of venting when Europa is closer to Jupiter.

One explanation for the variability is that these lineae experience more stress as gravitational tidal forces push and pull on the moon and open vents at larger distances from Jupiter. The vents are narrowed or closed when the moon is closest to the gas-giant planet.

"The apparent plume variability supports a key prediction that Europa should tidally flex by a significant amount if it has a subsurface ocean," said Kurt Retherford, also of Southwest Research Institute.



This is an artist's concept of a plume of water vapor thought to be ejected off the frigid, icy surface of the Jovian moon Europa, located about 500 million miles (800 million kilometers) from the sun.
Image Credit: NASA/ESA/K. Retherford/SWRI

The Europa and Enceladus plumes have remarkably similar abundances of water vapor. Because Europa has a roughly 12 times stronger gravitational pull than Enceladus, the minus-40-degree-Fahrenheit (minus-40-degree-Celsius) vapor for the most part doesn't escape into space as it does at Enceladus, but rather falls back onto the surface after reaching an altitude of 125 miles (201 kilometers), according to the Hubble measurements. This could leave bright surface features near the moon's south polar region, the researchers hypothesize.

"If confirmed, this new observation once again shows the power of the Hubble Space Telescope to explore and opens a new chapter in our search for potentially habitable environments in our solar system," said John Grunsfeld, an astronaut who participated Hubble servicing missions and now serves as NASA's associate administrator for science in Washington. "The effort and risk we took to upgrade and repair Hubble becomes all the more worthwhile when we learn about exciting discoveries like this one from Europa."

To view the images of the evidence for plumes visit: **http://www.nasa.gov/content/goddard/hubble-europa-water-vapor** .

Jia-Rui C. Cook JPL, Pasadena, Calif. jccook@jpl.nasa.gov

Goodbye Big Bang, Hello Black Hole? A New Theory Of The Universe's Creation

by ELIZABETH HOWELL *on* SEPTEMBER 18, 2013 UniverseToday.com

Could the famed "Big Bang" theory need a revision? A group of theoretical physicists suppose the birth of the universe could have happened after a four-dimensional star collapsed into a black hole and ejected debris.

Before getting into their findings, let's just preface this by saying nobody knows anything for sure. Humans obviously weren't around at the time the universe began. The standard theory is that the universe grew from an infinitely dense point or singularity, but who knows what was there before?

"For all physicists know, dragons could have come flying out of the singularity," stated Niayesh Afshordi, an astrophysicist with the Perimeter Institute for Theoretical Physics in Canada who co-authored the new study.

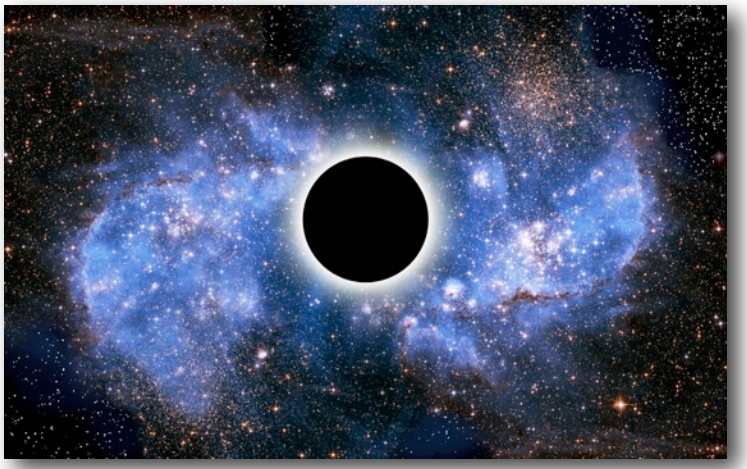
So what are the limitations of the Big Bang theory? The singularity is one of them. Also, it's hard to predict why it would have produced a universe that has an almost uniform temperature, because the age of our universe (about 13.8 billion years) does not give enough time — as far as we can tell — to reach a temperature equilibrium.

Most cosmologists say the universe must have been expanding faster than the speed of light for this to happen, but Ashford says even that theory has problems: "The Big Bang was so chaotic, it's not clear there would have been even a small homogenous patch for inflation to start working on."

This is what the physicists propose:

- The model they constructed has the three-dimensional universe floating as a membrane (or brane) in a "bulk universe" that has four dimensions. (Yes, this is making our heads hurt as well, so it might be easier to temporarily think of the brane as two-dimensional and the "bulk universe" as three-dimensional when trying to picture it.) You can read the more technical details in this 2000 paper on which the new theory is based.
- So if this "bulk universe" has four-dimensional stars, these stars could go through the same life cycles as the three-dimensional ones we are familiar with. The most massive ones would explode as supernovae, shed their skin and have the innermost parts collapse as a black hole.
- The 4-D black hole would have an "event horizon" just like the 3-D ones we are familiar with. The event horizon is the boundary between the inside and the outside of a black hole. There are a lot of theories of what goes on inside a black hole, although nothing has ever been observed.
- In a 3-D universe, the event horizon appears as a two-dimensional surface. So in a 4-D universe, the event horizon would be a 3-D object called a hypersphere.
- So basically, what the model says is when the 4-D star blows apart, the leftover material would create a 3-D brane surrounding a 3-D event horizon, and then expand.

The long and the short of it? To bring this back to things that we can see, it is clear from observations that the universe is expanding (and indeed is getting faster as it expands, possibly due to the mysterious dark energy). The new theory says that the expansion comes from this 3-D brane's growth. But there is at least one limitation.



Artist's conception of the event horizon of a black hole. Credit: Victor de Schwanberg/Science Photo Library

While the model does explain why the universe has nearly uniform temperature (the 4-D universe preceding it would have existed it for much longer), a European Space Agency telescope called Planck recently mapped small temperature variations in the cosmic microwave background, which is believed to be leftovers of the universe's beginnings. (Read more about the CMB here.)

The new model differs from these CMB readings by about four percent, so the researchers are looking to refine the model. They still feel the model has worth, however. Planck shows that inflation is happening, but doesn't show *why* the inflation is happening.

"The study could help to show how inflation is triggered by the motion of the universe through a higher-dimensional reality," the researchers stated.

You can read more about their research on this prepublished Arxiv paper. The Arxiv entry does not specify if the paper has been submitted to any peer-reviewed scientific journals for publication.

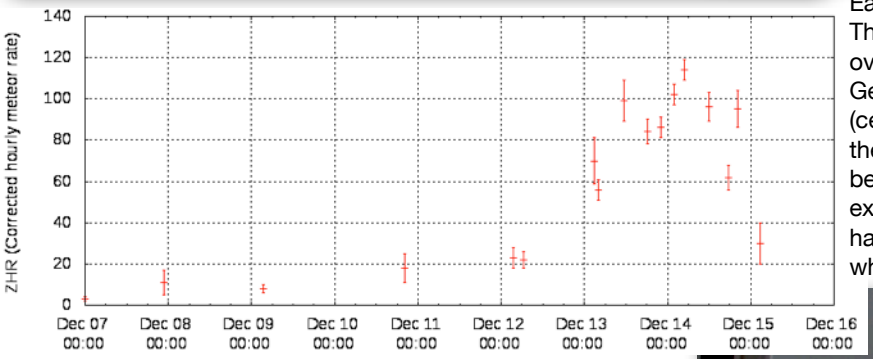
Read more: http://www.universetoday.com/104863/goodbye-big-bang-hello-hyper-black-hole-a-new-theory-on-universes-creation/#ixzz2loskIAkR

This artist's impression shows the surroundings of the supermassive black hole at the heart of the active galaxy NGC 3783 in the southern constellation of Centaurus (The Centaur). New observations using the Very Large Telescope Interferometer at ESO's Paranal Observatory in Chile have revealed not only the torus of hot dust around the black hole but also a wind of cool material in the polar regions. Credit: ESO/M. Kornmesser

From the Spaceweather.com Gallery:

Right: Three Dozen Geminids: Taken by **Yuri Beletsky** on December 13, 2013 @ Chile. "The image was obtained on the night 13/14 Dec from Las Campanas observatory in Chile. Despite almost full Moon, the Geminds were quite active producing many bright meteors. The total exposure time was about 4 hours". [I counted 35 Geminids and one possible sporadic in the image -ed]

"I was making time-lapses night before last (monday-tuesday) at the freezing -28°C weather. When transferring stuff I noticed this. I've seen some meteors but never this bright. So, just wanted to post this in case you're interested". said Henri Luoma. [Probably not a Geminid -but nice just the same -ed]
Canon 5D Mark II, 24mm, f2.8, 15sec, ISO2000
Taken by **Henri Luoma** on December 9, 2013 @ Kipina, Pudasjarvi, Finland.



The International Meteor Organization report on the Geminids included this graph of the activity over the interval from Dec 7 to Dec 16. Note the rather broad peak of over 100 per hour from Dec 13 to Dec 15 and the rapid drop-off on the evening of Dec 15. A total of 2123 meteors were counted by about 50 observers in 20 countries (none in Canada and only 3 in the USA). The average Zenithal Hourly Rate (ZHR) was 114 per hour. ZHR is a calculated value that would represent the number of meteors seen if the radiant were overhead and the moon was absent from a totally cloud-free sky. See the original data at http://www.imo.net/live/geminids2013/

Early December was pretty snowy and clear nights were rare. The night of the peak of the Geminids looked a bit less overcast than usual and I made an attempt to catch a bright Geminid or two -they had to be bright since only Jupiter (centre) at magnitude -2.7 and a couple of the bright stars of the Winter Hexagon were visible through the clouds. Image below is a 5 s shot (the moon was just too bright for longer exposures) at ISO 1600 f.l.= 10 mm f/2.8. A portion of the lunar halo is just visible at top right. Anyway, on 979 images (half of which were of thicker clouds) not a single Geminid appeared.

Piscis Austrinus -Southern Fish

α Piscis Austrinus - Fomalhaut

The landmark of this constellation is the star Fomalhaut, the brightest star in this area of the sky and the southernmost of the bright stars visible from northern latitudes. It has a magnitude of 1.3, ranking 17th in brightness among the 20 brightest stars. Fomalhaut, because of its isolated position in the sky, is known as the "Solitary One." The stars in this constellation, aside from Fomalhaut, are of the 4th and 5th magnitudes; however, they form an outline clearly resembling a fish. Observe this constellation on a clear dark night.

Sculptor (Scl)

Sculptor is a constellation of rather faint stars; the three brightest, α, β and γ-Sculptoris, have magnitudes of about 4.5 . This area and the constellation to the east, Fornax, are very poor in stars as these areas lies in a direction perpendicular to the galactic plane. The constellation contains one object well worth viewing; it is the spiral nebula NGC 253, a very large nebula [galaxy actually -ed] seen almost edge-on. After M31, the Great Nebula of Andromeda, it is the brightest of the spiral nebula. Location 0045**25**

Objects of Interest in Sculptor

NGC 253 - spiral galaxy , mag. 7.6, 30' x 7' in size. Loc'n: 0045**25**.

Capricornus (Cap)

α Capricorni - Giedi
β Cap - Dabih γ Cap - Nashira δ Cap - Deneb Algiedi

Next to Cancer, Capricornus is the least prominent of the zodiacal constellations. A line connecting α and θ Pegasi extended to the southwest about 25° will locate this constellation. β and δ Capricorni, its two brightest stars, lie on either side of the ecliptic about 20° apart. α and β Capricorni make a conspicuous pair only 2° apart, an aid in locating the constellation. β Capricorni is a fieldglass double, orange and blue; a fine pair.

Double Stars

Star	Mag.	Sep'n (s)	Location	Remarks
α1	4.6-9.0	45	2015**13**	Both Yellow.
α2	3.8-9.5	154	2015**13**	Both Yellow; α1 and α2 together form a double double; v. fine.
β	3.1-6.0	205	2018**15**	Orange-Blue.
o	6.1-6.6	22	2027**19**	White-Pale Blue; striking pair.
π	5.2-9.0	3	2024**18**	Yellow-Pale Blue.
ρ	5.0-10.0	2	2026**18**	Yell.-Purp.; gd.contrast.
σ	5.5·12.0	56	2016**19**	Orange-Blue.

Messier Objects

	Mag	Location	Remarks
M 30	8.4	2138**23**	Globular Cluster, beautiful

Fomalhaut: more "Solitary" in 2013/14

by John Hlynialuk

The last time I wrote about the lonely star **Fomalhaut** (pronounced "foam a lot") was in SGN for Dec 2010. Then, Jupiter was keeping it company but, now, Fomalhaut is once again on its own. Venus, the only planet nearby, was trekking along to the East towards Fomalhaut, but she stopped her eastward motion mid-December (never getting closer than 40°) and headed back towards the Sun. Fomalhaut just can't catch a break any time of year.

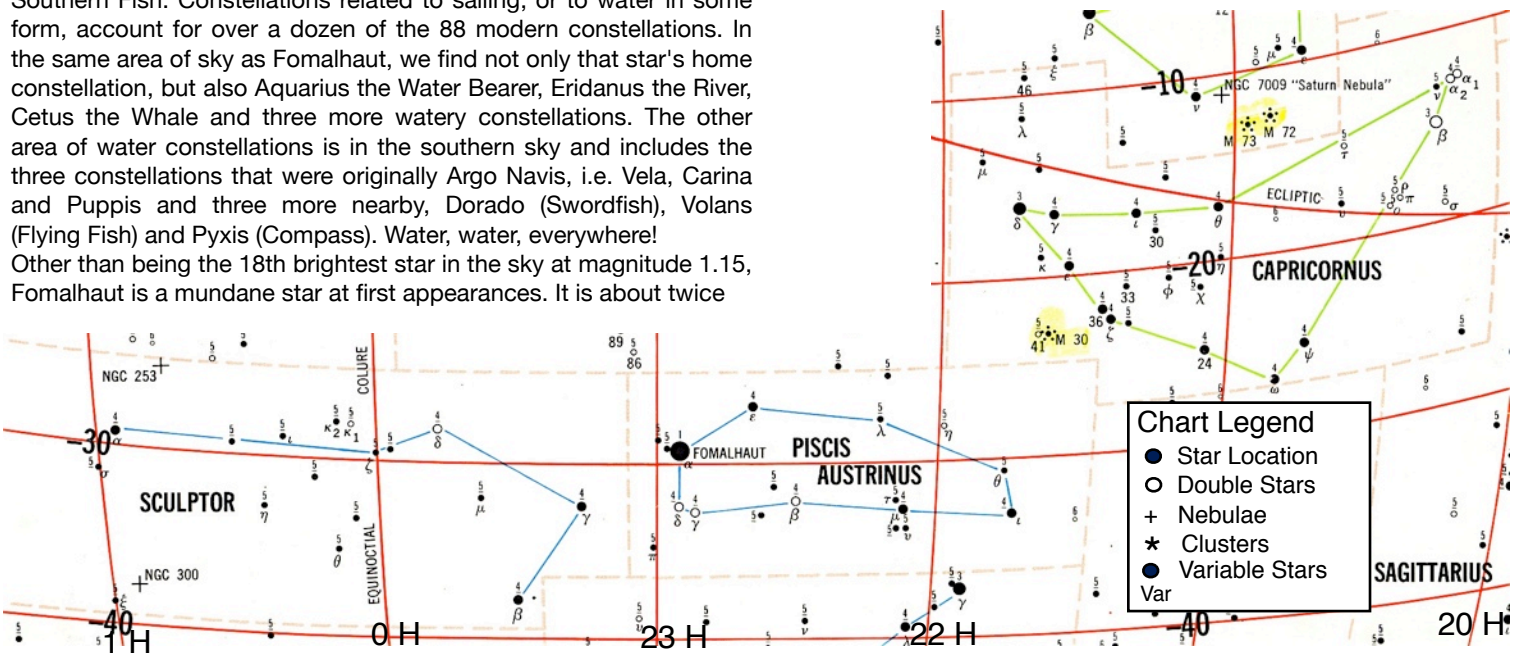
Look south on any clear night in winter and the "Solitary One" is the only noticeable star in the sky over an arc of about 90 degrees. What's more, α-Piscis Austrinus always follows a low arc in the southern sky and is absent from view (like Sagittarius) for most of the year.

Fomalhaut's Arabic name, translated as "the Mouth of the Fish", denotes its position in the constellation Piscis Austrinus, the Southern Fish. Constellations related to sailing, or to water in some form, account for over a dozen of the 88 modern constellations. In the same area of sky as Fomalhaut, we find not only that star's home constellation, but also Aquarius the Water Bearer, Eridanus the River, Cetus the Whale and three more watery constellations. The other area of water constellations is in the southern sky and includes the three constellations that were originally Argo Navis, i.e. Vela, Carina and Puppis and three more nearby, Dorado (Swordfish), Volans (Flying Fish) and Pyxis (Compass). Water, water, everywhere!

Other than being the 18th brightest star in the sky at magnitude 1.15, Fomalhaut is a mundane star at first appearances. It is about twice as big as the sun, about 18 times as luminous and a relatively nearby 25 light years away. Most amateur astronomers pretty much ignore it and few star talks include anything of interest about it other than that it has a funny pronunciation.

But in November of 2008, all that changed. In a disk of debris surrounding the star -a feature that has also been detected around some other stars, a tiny point of light was seen to change location over a two-year interval. That object was the first planet (Fomalhaut-b) of another star to be photographed in visible light (the Hubble Space Telescope, of course) and was **the first directly observed exoplanet**. Estimates of the mass of Fomalhaut-b put it possibly as much as 3 times Jupiter's mass to as "small" as the mass of Neptune.

So now, every amateur giving a sky tour can point to a nice bright star and say, "Yes, we have direct proof of a planet circling another star and that star is right there - Fomalhaut. It is solitary no more!"



Times in Eastern Standard Time have been added after the dates.

Jan 01 06:14 **NEW MOON** rises locally at 7:46 am EST.
16:00 Moon at Perigee: 356 922 km
Jan 03 15:00 Quadrantid Meteors, 120/h (Moon interferes)
Jan 04 00:59 Earth at Perihelion: 0.98333 au
Jan 05 15:00 Jupiter at Opposition (magnitude -2.7)
Jan 07 22:39 **FIRST QUARTER MOON** rises locally 11:29 EST
Jan 11 07:00 Venus at Inferior Conjunction (not visible near Sun)
Jan 12 03:36 Aldebaran 2.6°S of Moon
Jan 15 01:00 Jupiter 4.9°N of Moon
Jan 15 20:53 Moon at Apogee: 406 537 km
23:52 **FULL MOON** rises locally at 5:07 pm EST
Jan 18 23:43 Regulus 5.2°N of Moon
Jan 23 01:29 Mars 3.7°N of Moon
04:22 Spica 1.3°S of Moon
23:00 Venus at Perihelion
Jan 24 00:19 **LAST QUARTER MOON** rises locally 1:12 am EST
Jan 25 09:18 Saturn 0.5°N of Moon: Occultation (not vis.locally).
Jan 26 05:25 **Spectacular Graze of v-Scorpii**, 4th mag **quadruple** star, track right over ES Fox! Moon 13° high. See pg 4.
Jan 28 21:36 Venus 2.2°N of Moon (dawn sky)
Jan 30 04:58 Moon at Perigee: 357 080 km
16:39 **NEW MOON** rises locally at 7:07 am EST
Jan 31 05:00 Mercury at Greatest Elong: 18.4°E
Mercury and one-day old crescent 5.3° apart

BAS Events

BAS does not meet in January or February due to the generally poor winter driving conditions. Our next regular meeting takes place at the Grey Roots Museum at the usual time on March 5, 2014. However, impromptu viewings still go on at the Fox Observatory as weather permits. Regular members receive notifications of these (usually fairly short notice) as they occur. If you are not a regular member and are not on the notification email list please send a short note to John, Aaron or Brett at one of the emails listed in the BAS Executive box on pg 2.

Special Events

Meteors and a Graze

Quadrantid Meteors Jan 3: Winter is not the best time to be lying around on a lawn chair watching shooting stars for all hours, but if the night is clear, it can nevertheless be exhilarating. If the shower is one you have never seen before, it can even be interesting. The shower in question has a radiant in an extinct constellation called Quadrans Muralis, which was located in a star-poor part of sky above the "kite" of Bootes and "East" of the handle of the Big Dipper. It was created by French astronomer Lalande to commemorate the quadrant -a star-position measuring device, made famous by Tycho Brahe among others.

The shower has a fairly high rate of 120/h but one prediction gives the peak time during daylight on Friday at 3 pm. Uncertainties may shift things even more. The best one can say is that this shower is unpredictable and bears watching, even for a hour or two in the January cold. Watch your email as the event nears and weather predictions are more certain.

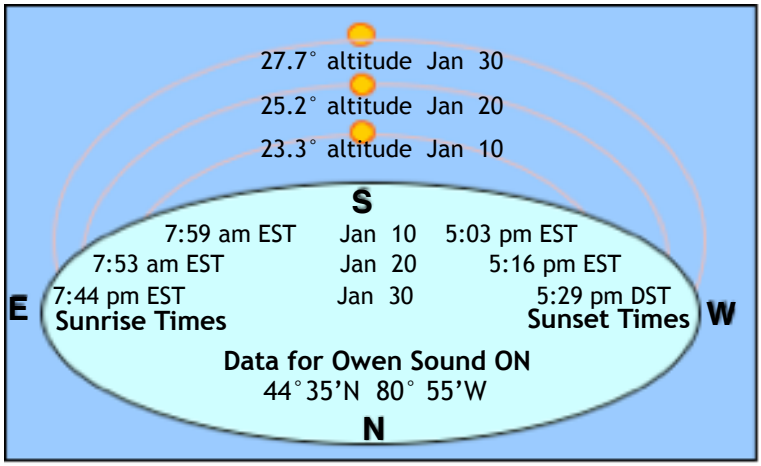
Grazing Occultation of v-Scorpii Jan 26: This very interesting graze is described in more detail on page 4 of this issue. Once again, watch your emails for weather information as we get closer to the event. Both meteor shower and graze can be watched from the ES Fox Observatory although these are not the only places where they will be visible. The meteors can be watched from your home location if you have a clear, dark observing site and the graze line actually passes through Owen Sound as well as the Fox Observatory. Isn't Nature co-operative! Contact graze-meister John H. for more information.

Planets

MERCURY, re-appears in the evening sky in the second half of January and is farthest from the sun and bright (-0.6) at month end. **VENUS,** drops to -4.0 by mid-month as it passes behind the Sun. It switches to Morning Star status and becomes visible in the last week of Jan. A thin last crescent Moon is near Venus on Jan 28 and 29. **MARS** (0.6) is now rising around midnight and is visible till dawn in Virgo. **JUPITER**, (-2.7) is rising at dusk and setting at dawn as it reaches opposition Jan 5. **SATURN,** (mag 0.5) rises at 4 am at the start of January and by 2 am at the end. Ring tilt is very nice about 22.5 degrees in Jan. Both **URANUS,** (5.7) and **NEPTUNE,** (7.8) are above the horizon after sunset but they are setting more and more quickly. By month end Neptune sets by 7 pm and Uranus by 10 pm. Both the **asteroid, Vesta (6.6)** and dwarf planet, **Ceres (7.3)** are in the same part of the dawn sky as Mars. Charts are available on the BAS website. **PLUTO** (mag. 14) is in twilight at dawn presently and near Venus at month-end, but requires accurate star charts to locate in the dawn sky.

The diagram below gives the sunrise/sunset times and the Sun's altitude on three dates this month. The sun passed Winter Solstice Dec 21 last year and is slowly gaining elevation during January.

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



Jan 2014

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

TWO 12-inch Dobs available.

Both 12-inch loaner telescopes are available for the summer. Our two **8-inch dobsonians** are presently out on loan. Contact Brett T. or Aaron T. to check on availability. Scopes come in and out periodically so keep checking with Brett or Aaron if you are interested in a loaner.

SGN Classified Ads Section

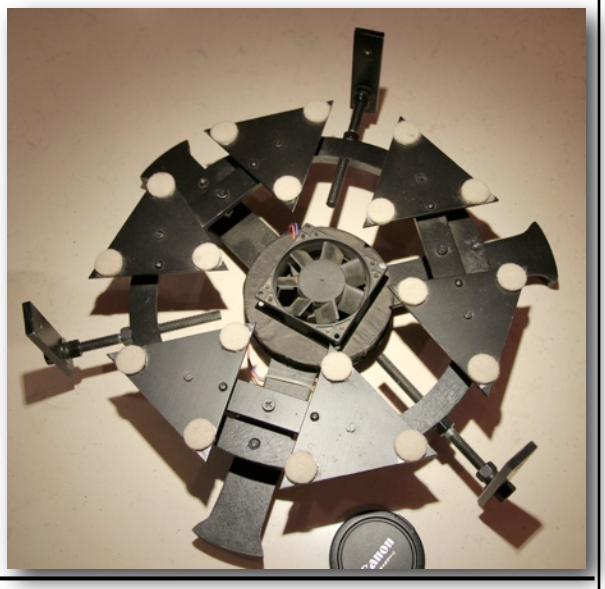
(Now also on our website)

FOR SALE: Televue Pronto

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 $ 700.-- Firm Anton VanDijk 519 376-9912 ravand@rogers.com

FOR SALE: 16-inch mirror cell

Aluminum 18-point suspension mirror cell for 16 inch mirror (will accommodate 14 in). Comes with central cooling 12 V DC computer fan. Additional cooling fans available $5 ea. Asking $100 for cell.Contact John H. 519 371-0670 stargazer@wightman.ca



FREE: Mirror-grinding machine to a good BAS home

One of our former members has donated a 90% finished mirror-grinding machine to BAS and we have decided to put it out there for anyone in the club who wants to give it a good home.

Note that it is not finished but plans are available from Mirror-o-Matic.com and we have a copy of the file on computer. This unit was designed to do 12 inch mirrors but will handle smaller (8 & 10 inch) mirrors with some minor adjustments. BAS also has pretty much complete kits of abrasives and maybe even a mirror blank or two that we will include with the deal. Comes with documentation and a copy of Edmund Scientific Co. Mirror Grinding booklet. Note this outfit is free to current BAS members but if you are not a member, then you can purchase the unit for $120 and we will throw in a year's membership. Contact John (stargazer@wightman.ca) if you are interested.

The Cartoon Corner