Star Gazer News

Astronomy News for Bluewater Stargazers
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Feb 2015 Contents

Astronomers have detected the largest X-ray flare ever from the supermassive black hole at the center of the Milky Way using NASA's Chandra X-ray Observatory. This event was 400 times brighter than the usual X-ray output from the black hole. Credit: NASA/CXC/Northwestern Univ/D.Haggard et al.
Image Credit: NASA/CXC/Stanford/I. Zhuravleva et al.

NASA's Chandra Detects Record-Breaking Outburst from Milky Way's Black Hole

Astronomers have observed the largest X-ray flare ever detected from the supermassive black hole at the center of the Milky Way galaxy. This event, detected by NASA's Chandra X-ray Observatory, raises questions about the behavior of this giant black hole and its surrounding environment.

The supermassive black hole at the center of our galaxy, called Sagittarius A*, or Sgr A*, is estimated to contain about 4.5 million times the mass of our sun.

Astronomers made the unexpected discovery while using Chandra to observe how Sgr A* would react to a nearby cloud of gas called G2.

"Unfortunately, the G2 gas cloud didn't produce the fireworks we were hoping for when it got close to Sgr A*," said lead researcher Daryl Haggard of Amherst College in Massachusetts. "However, nature often surprises us and we saw something else that was really exciting."
On Sept. 14, 2013, Haggard and her team detected an X-ray flare from Sgr A* 400 times brighter than its usual, quiet state. This "megaflare" was nearly three times brighter than the previous brightest X-ray flare from Sgr A* in early 2012. After Sgr A* settled down, Chandra observed another enormous X-ray flare 200 times brighter than usual on Oct. 20, 2014.

Astronomers estimate that G2 was closest to the black hole in the spring of 2014, 15 billion miles away. The Chandra flare observed in September 2013 was about a hundred times closer to the black hole, making the event unlikely related to G2.

The researchers have two main theories about what caused Sgr A* to erupt in this extreme way. The first is that an asteroid came too close to the supermassive black hole and was torn apart by gravity. The debris from such a tidal disruption became very hot and produced X-rays before disappearing forever across the black hole's point of no return, or event horizon.

"If an asteroid was torn apart, it would go around the black hole for a couple of hours – like water circling an open drain – before falling in," said co-author Fred Baganoff of the Massachusetts Institute of Technology in Cambridge, Massachusetts. "That's just how long we saw the brightest X-ray flare last, so that is an intriguing clue for us to consider."

If this theory holds up, it means astronomers may have found evidence for the largest asteroid to produce an observed X-ray flare after being torn apart by Sgr A*.
A second theory is that the magnetic field lines within the gas flowing towards Sgr A* could be tightly packed and become tangled. These field lines may occasionally reconfigure themselves and produce a bright outburst of X-rays. These types of magnetic flares are seen on the sun, and the Sgr A* flares have similar patterns of intensity.

In addition to the giant flares, the G2 observing campaign with Chandra also collected more data on a magnetar: a neutron star with a strong magnetic field, located close to Sgr A*. This magnetar is undergoing a long X-ray outburst, and the Chandra data are allowing astronomers to better understand this unusual object.

These results were presented at the 225th meeting of the American Astronomical Society being held in Seattle.

An interactive image, a podcast, and a video about the findings are available at: http://chandra.si.edu

BAS Executive 2013-2015

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From BAS Exec: Elections

BAS executive positions run for two years and normally the first meeting of the year is election time. This year the executive has decided to hold **elections at the April 1 meeting in 2015** so that we can implement an email voting system. This will allow all current BAS members (not just those present at the meeting) to take part in the election of their executive.

The reason for this is simple: BAS members come from all over Bruce and Grey (and elsewhere) and some find it difficult to attend the AGM. Also the new Ontario Non-profit Corporations Act (once enacted in the next year or so) will allow for electronic voting -we could not do it under the old regulations. **We would like to have ALL members involved in voting.**

So, as in previous years, to start the process off, exec is **calling for nominations**. If you wish to put your name forward **for ANY of the four executive positions** please send an email to Greg R. at grodgers@bmts.com **before the end of February** so we can announce the list of candidates at the March meeting. Note that **you must be a current member (2015 dues paid) to vote or stand for executive position**. Membership fees are due at the March meeting but send your nominations in before that. You can mail 2015 dues to the treasurer Cheryl or membership chair Dave or pay at the March meeting.

Note that the Past President, Membership Chair and Social Media are not elected positions but appointments by unanimous executive approval (or a default position as in the case of Past President). Current appointees will continue in those positions until they decide to opt out of their duties.

BAS executive consists of four positions (president, vice-president, secretary and treasurer) and two non-elected chairpersons who manage the jobs of membership and social media. In the past we also had a public outreach chair but that job seems to now carry itself. We no longer have to "beat the drum" to be invited to do star tours. For example, last November, Minor Hockey News contacted us out of the blue for an article on the club since they were also including information about other recreational and club activities for kids in our area. They liked the item so well it ended up as a two page centre spread! That page is currently posted on our website if you want to have a look.

A currently-unfilled position that involves an appointee by the executive is called Member-at-Large. Duties here are light and involve tasks that are technically not done by other exec members but which need to be done from time to time. The Member-at-Large can also suggest to exec items that he/she feels need to be done to enhance the club experience. It is a chance to contribute and have a say in the direction of the club without the obligations of taking on a full exec position. We welcome volunteers for this position at any time.

Astronomical Events in Feb

BAS meetings are not held in January and February but impromptu observing continues at the Fox Observatory on an individual or small group basis. To be put on the notification list email Brett T at <bretttatton@gmail.com>. More details about the following events can be found on pg 14 or on the BAS website: www.bluewaterastronomy.info:

Feb 3 Tue	**Full Moon** rises 5:42 pm locally
Feb 6 Fri	**Jupiter at opposition** Big and bright, in the sky all night at mag -2.6 !
Feb 11 Wed	Last Quarter Moon rises 12:31 pm locally
Feb 18 Wed	**New Moon**
Feb 20 Fri	**Venus, Mars and Crescent Moon.** All three fit in a 2° circle. Uranus sits 15° above the group as well.
Feb 21 Sat	**Uranus (5.9) occulted by Moon** Disapp. at 5:49 pm EST, Reapp. at 6:42 pm EST. ES Fox Viewing for Members/guests
Feb 25 Wed	**FQ Moon** rises locally at 11:13 am EST
Feb 28 Sat	**Deadline for nominations for executive positions. Send nominations to Greg R. at grodgers@bmts.com**

Note: nominations can also be made at the March 4 meeting and these will be included in the slate of candidates for the email vote.

From the Editor:

On a personal note, serving on the executive of BAS has been an experience that I have enjoyed and found very gratifying over the years. As a part of a very dynamic group that has done so much over the years to promote astronomy, it has been a privilege to continue to do my part.

Right from the beginning, BCAS and now BAS members have given of their time and expertise: the result is an organization that we all can be proud of. I think of members who have donated telescopes, their astronomy libraries, worked on the ES Fox Observatory project and most of all, given their time and knowledge sharing their interest and passion for astronomy on public stargazing nights.

On behalf of BAS exec, thanks to all of you who have shared the views through your telescopes or cameras. We know you get a lot of satisfaction from doing so, but know that it is appreciated and that sharing the wonder of the natural world, with young folks, especially, is important work. THANK YOU!

Rosetta Reignites Debate on Earth's Oceans

Dec. 14, 2014: Where did our planet get its oceans? One popular theory holds that water was brought to Earth by the ancient impacts of comets and asteroids. However, new data from the European Space Agency's Rosetta spacecraft indicate that terrestrial water did *not* come from comets like 67P/Churyumov-Gerasimenko. The findings were published Dec. 10th in the journal Science.

Researchers agree that water must have been delivered to Earth by small bodies at a later stage of the planet's evolution. It is, however, not clear which family of small bodies is responsible. There are three possibilities: asteroid-like small bodies from the region of Jupiter; Oort cloud comets formed inside of Neptune's orbit; and Kuiper Belt comets formed outside of Neptune's orbit.

The key to determining where the water originated is in its isotopic "flavor." That is, by measuring the level of deuterium – a heavier form of hydrogen. By comparing the ratio of deuterium to hydrogen in different objects, scientists can identify where in the solar system that object originated and by comparing to Earth's D/H ratio, identify the origin of our water.

The Rosetta Orbiter Spectrometer for Ion and Neutral Analysis (ROSINA) instrument has found that the composition of Comet 67P/'s water vapor is significantly different from that found on Earth - more than three times the terrestrial value. This is among the highest-ever-measured values in the solar system. That means it is very unlikely that comets like 67P/Churyumov-Gerasimenko are responsible for the terrestrial water.

In 1986, the mass spectrometers on board the European Giotto mission to comet Halley for the first time determined D/H ratios in a comet. It turned out to be twice the terrestrial ratio. The conclusion at that time was that Oort cloud comets, of which Halley is a member, cannot be the responsible reservoir for our water. Several other Oort cloud comets displayed similar D/H values. Subsequently, models that had comets as the origin of terrestrial water became less popular.

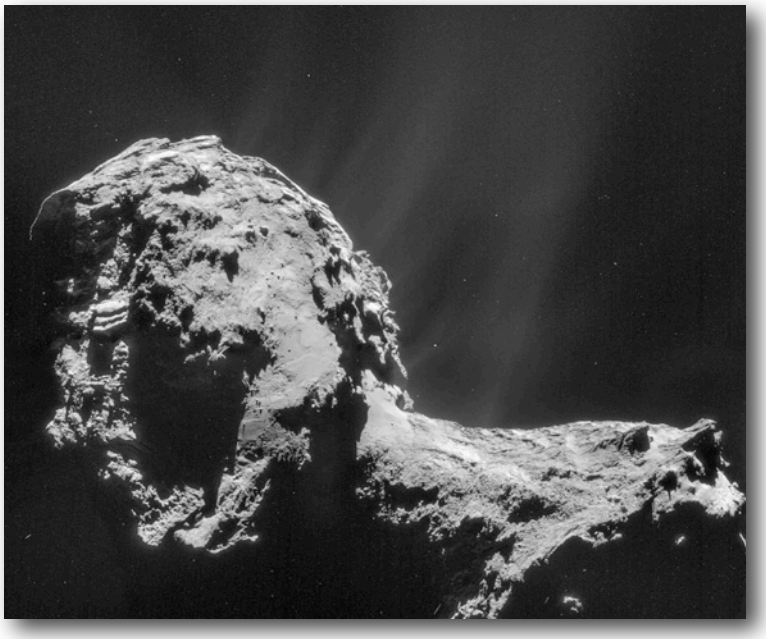
This changed when, thanks to the European Space Agency's Herschel spacecraft, the D/H ratio was determined in comet Hartley 2, which is believed to be a Kuiper Belt comet. Surprisingly, the D/H ratio found was very close to our terrestrial value. Most models on the early solar system claim that Kuiper Belt comets should have an even higher D/H ratio than Oort cloud comets because Kuiper Belt objects formed in a colder region than Oort cloud comets.

The new findings of the Rosetta mission make it more likely that Earth got its water from asteroid-like bodies closer to our orbit and/or that Earth could actually preserve at least some of its original water in minerals and at the poles.

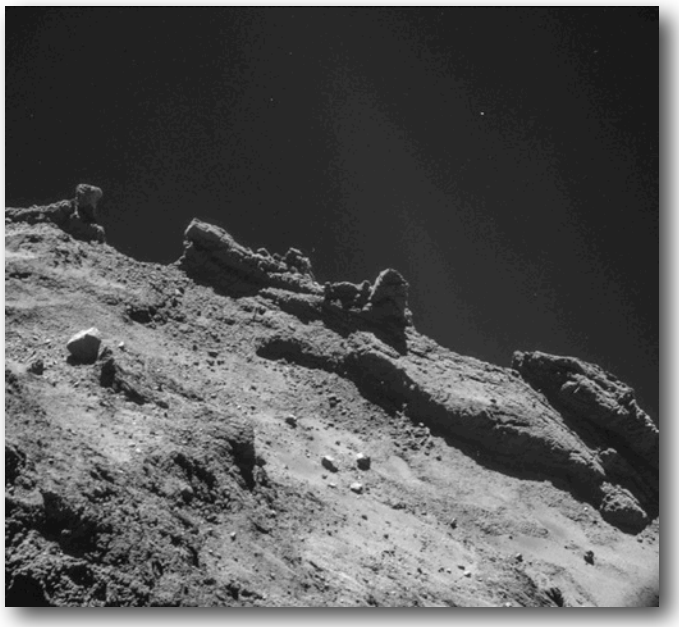
"Our finding also disqualifies the idea that Jupiter family comets contain solely Earth ocean-like water," said Kathrin Altwegg, principal investigator for the ROSINA instrument from the University of Bern, Switzerland, and lead author of the Science paper. "It supports models that include asteroids as the main delivery mechanism for Earth's oceans."

Comets are time capsules containing primitive material left over from the epoch when the sun and its planets formed. Rosetta will be the first spacecraft to witness at close proximity how a comet changes as it is subjected to the increasing intensity of the sun's radiation. Observations will help scientists learn more about the origin and evolution of our solar system and the role comets may have played in seeding Earth with water, and perhaps even life.

Credits:
Production editor: Dr. Tony Phillips | Credit: Science@NASA
More information on the U.S. instruments aboard Rosetta, visit: http://rosetta.jpl.nasa.gov
More information about Rosetta here: http://www.esa.int/rosetta



This composite is a mosaic comprising four individual NAVCAM images taken from 31 km from the center of comet 67P/Churyumov-Gerasimenko on Nov. 20, 2014. The image resolution is 3 m/pixel. ***Image Credit:*** *ESA/Rosetta/NAVCAM*



This scene above presents a dramatic view across the body of the large lobe of Comet 67P/Churyumov–Gerasimenko. Along the horizon a relatively broad, raised portion of material appears to be abruptly truncated in the top left. Zooming into either side of the inner portion of the wall suggests the presence of slightly brighter material – perhaps more recently exposed than other sections. Although cast in shadow, the sides of the raised section shows signs of clear layering, along with fractures cross-cutting in many orientations.

In the foreground, several large angular blocks are seen, some with faces that appear brighter than the surrounding material. In the background, a faint stream of gas and dust can be seen, showing that an active region is nearby.

This single-frame NAVCAM image measures 1024 x 1024 pixels. It was captured from a distance of 9.8 km from the centre of the comet (about 7.8 km from the surface) at 18:08 GMT on 26 October 2014. At this distance, the image resolution is 83.7 cm/pixel and the size of the image is 857 x 857 m.

Credit: *ESA/Rosetta/ NAVCAM – CC BY-SA IGO 3.0*

From 42°N & 81°W, My Life so Far with Naked Eye Comets - a reminiscence by Robert Atkinson

With the arrival of Comet Lovejoy, a recent discussion came up as to how many comets would be observable in an average person's lifetime.

Being mostly a visual observer from the young age of 6, this is what I remember. These comet were visible with the naked eye (magnitude 4 or less) from the wonderful jet-stream-laden location of SW Ontario.

As a young teenager growing up on a farm and being an avid reader of Sky&Telescope, I remember hunting feverishly for my first comet. Leaning against the barn, it was a coolish late evening. Upon sighting it high in the western sky with much effort, I was very disappointed. The comet in question I believe was Kohoutek. This is but a very faint memory.

Fast forward to March of 1976 and Comet West was a spectacular sight in the eastern dawn sky. Wow! I remember it vividly to this day. This is one of my fond astro memories from living on the farm.

After a long dry period, the "Big Bopper" comes along! Hale-Bopp to be exact in the summer of 1997. My experience with this comet is a bit strange.

I observed with my wife and son who at the time was only 6 years old. Both she and my son, riding on my shoulders, remember the comet vividly. Two tails they say as we observed it from our home in the city of London. Strange? What's so strange about that you may ask? Well I remember absolutely nothing about the experience or the comet. NOTHING! All they do is laugh at me whenever the topic comes up.

Sixteen years later, March of 2013 and we have Panstarrs. This comet was notable for me as it was the first comet I ever imaged. The first evening attempt in March 2013 was a disaster. I had just bought the camera and had no clue how to run it! My friend got upset at me cause he didn't know how to run it either, and Panstarrs was setting fast. A couple of strangers happened by to look at the comet and one of them had a Canon 60D. So he showed my friend how to run it but all the pics he took were too dark and out of focus. Needless to say he stayed home the next night!

So before the next evening's imaging session I brushed up on the operation of my camera and took my first decent images. I have included the best image entitled "Panstarrs Wired". [upper right]
Yes, I happen to like the wires as it's my first astro image ever. The wires are a constant reminder for me to think about my surroundings and to compose the picture carefully with interesting and not too obtrusive foreground objects. Yes I could remove the wires with software but I shoot what I see and leave it at that. Crop and bump (contrast) if necessary -that's my minimalist style.

However I digress. Back to comets.
So for me, really there are only three notable naked eye comets so far in my lifetime. These were easily observable and even of interest to the general public. Hopefully before my time is up I'll get the opportunity to observe a couple of more decent comets comparable to the ones mentioned.

Now that I know how to run my camera, I'll even supply images of them too.

In closing I'd like to encourage everyone to get out there and observe every comet that comes along, even Lovejoy!

Life is precious and short. So even seeing one comet the caliber of West or Hale-Bopp will stay with you for a lifetime. Assuming you can remember it!

***Image above** by Robert A, taken with Canon 60D camera Mar 17, 2013, 70 mm focal length, ISO 800, f/4, 2 second exposure.*

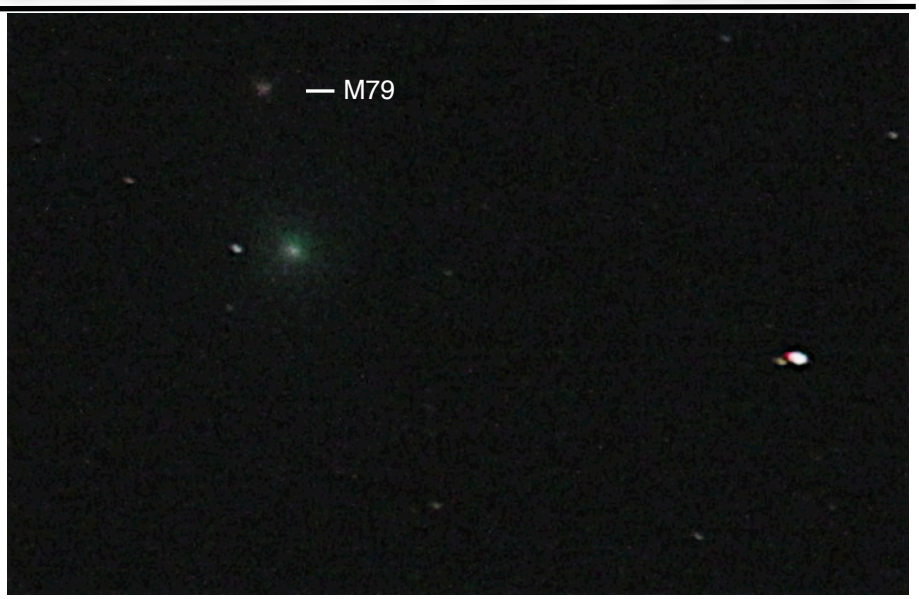
***Image Left:** Comet West Mar 22, 1976 by John H from a school yard in Windsor ON. Original Ektachrome 160 slide, scanned, then processed in PS Elements 11. A 3 min, exp. Yashica camera, lens 50 mm f/2.0 piggyback and hand-guided on a Tasco Lunagrosso 4" telescope. [I also did an 8 minute shot the next week]. West was moving slowly upwards towards "Job's Coffin" the centre of Delphinus. [See July 2014 SGN for the story of Sualocin and Venator in Delphinus -interesting!]. The comet spent a couple of weeks moving through Delphinus -a very nice sight indeed.*
I remember it well!

Comets Lovejoy and Finlay: Viewing in February

A pair of comets grace the cold winter skies, but one is easier to see than the other. Lovejoy climbed steadily towards 4th magnitude and on Dec 29 when it was between magnitude 5 and 6, it slipped past the small globular cluster M79 (magnitude 8.5). It is still visible easily in binoculars (Jan 26).

The other comet, Finlay is much fainter. An outburst in mid December, then return to 10th magnitude was followed by another in January! Now Finlay is about magnitude 9 and no telling what it will do. Both comets should be visible in the early evening in late Jan/Feb and both are in the same general area of sky. By the end of the first week of February, Lovejoy becomes circumpolar and is visible all night long.

The finder chart below right shows the positions at 8 pm EST of each comet from Jan 20 to Mar 6 and Venus, Mars and Uranus on Mar 6, 2015. Note that the Crescent Moon is less than a degree from Finlay on Jan 23 and brightens the sky for the next week or so. Once it passes full and starts to rises later, there is a wider window for observing these now fading objects. Catch them whenever the skies clear!



Robert A. snapped an image of Comet Lovejoy on one of the two briefly clear nights in Dec 2014. This is an enlargement from a frame taken with a 200 mm focal length at f/5, ISO 3200, t=3.2 seconds. Image taken with a Canon camera on tripod, so the stars and comet are slightly trailed. The green glow is from C2 molecules fluorescing in sunlight. The faint object above the comet is M79.

BAS makes SkyNews (again)

On Saturday night at Starfest 2014, Sky News editor Terrence Dickinson appeared at the BAS campsite and took this image. It shows Frank P. guiding the Webster-28 to interesting sky sights for a long line of observers. These folks, young and old, waited patiently to look through the largest reflector that regularly appears at Starfest (one year we were only beat out by Normand Fullum's 36-inch!). Terry's image appeared in the Nov/Dec 2014 SkyNews -see pg 6 if you have a copy. SkyNews now comes with a digital version as part of the regular subscription and is a real bargain. I renewed my own plus two gift subscriptions for a total of $60. This is a great way to share the hobby with friends and relatives.

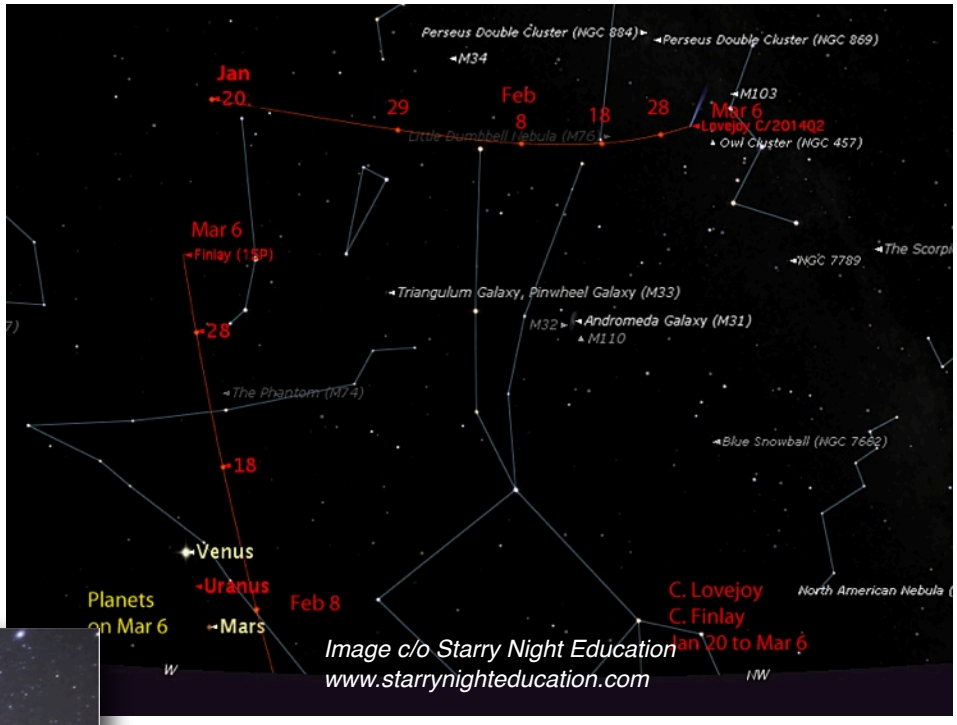


Image c/o Starry Night Education
www.starrynighteducation.com

Finder chart for Lovejoy and Finlay through to Mar 6 is available in higher resolution from the BAS website. All popular planetarium programs chart them as well.

In case you were wondering, the other mention of BAS in SkyNews was in a two page writeup by Peter MacMahon in the Mar/Apr 2013 issue called "Bluewater Skies" which featured the Bruce Peninsula as a Dark Sky Preserve. The cover of the Nov/Dec 2014 issue where the image left appeared is shown at right.

Comet Lovejoy Images

Comet Lovejoy was first seen by several BAS members from the Fox Observatory and by Robert A. in London ON on Jan 13. Two other clear nights on Jan 16 and Jan 19 also allowed viewing as Lovejoy slipped past the Pleiades. Also Jan 19 to 21 was clear enough at times for views of the comet as it sailed through Taurus towards Aries. Images on this page record the efforts of several imagers who took advantage of the clear sky and braved the cold temps (one night was -18C).

Several observers commented on how fast it was moving through the sky -about 1 moon width every 5 hours (0.1° per hour).
By far the prettiest sight was the time when Lovejoy was near the Pleiades. Cameras were snapping away all over the world. Check the Comet Gallery at www.spaceweather.com for more images.

Image Left: *Paul Z. recorded Comet Lovejoy near its maximum brightness on Jan 21 with a faint tail that was just visible in binoculars (the green colour was not so obvious). This image was 6 minutes through each of 4 filters: LRGB. 12 inch f/4.27 Astrograph and STL11000M CCD camera.*

Image Right. *Steve I. demonstrates how simple the comet was to record in this image taken with a camera on a tripod.*
He writes: *There's a pretty little comet in the winter sky now that is well located for easy observing. Comet Lovejoy is currently between the Pleiades and Aries. It is a faint object, but visible with the naked eye as a small fuzzy patch if you have a rural sky that is free of light pollution. I took this simple, tripod mounted photo of it last night. It was a short exposure, so not too much of the tail is visible, but it was still good to see a comet in our night sky once again.*
Details*: Canon 6D camera, 200mm lens at f/3.2, ISO 5000, a stack of ten 5 sec. exp., Jan. 20, 2015, 10:33 p.m. EST, Big Bay, ON*

Image left *by John H. taken with an 85 mm zoom lens (set at 85 mm) and Canon 60Da at f/5.6 and ISO 3200, single 120 s exposure. Processed in Photoshop Elements 11. Image taken Jan 16 at 8:43 pm when Lovejoy was 8.5° away from the Pleiades. Tracking by SkyWatcher Star Adventurer which worked perfectly straight out of the box!*

Motivated by a Mysterious Light in the Sky

"The most beautiful thing we can experience is the mysterious. It is the source of all true art and science."
Albert Einstein

As most of the readers of my column know, my wife, Paula, and I spend most of our winter season at Arizona Sky Village (ASV), located near Portal, AZ, at the entrance to Cave Creek Canyon. This astronomer's retreat was the brainchild of Jack and Alice Newton and developer, Gene Turner. They couldn't have chosen a better location for their astronomy village. Arizona Sky Village has magnitude 7.5 skies, numerous mountain hiking trails, fascinating desert and mountain ecosystems, friendly people, and an engaging Cowboy-Indian "old west" history. (Paula really likes history!)

Jim Algots at ASV

Arizona Sky Village is home to a fascinating community of astronomers. Each one has been motivated by the beauty and mystery of the night sky and has an inspirational story to share. To name a few: **Jack Newton** is the village astronomy celebrity and he pursues an active search for Type 1A supernovae; **Rolf Meier**, discoverer of 4 comets, produces amazingly detailed images of the planets; **Fred Espanek**, called Mr Eclipse, regularly publishes eclipse predictions and, as an astro-imager, Fred creates beautiful wide-field sky images of eclipses, conjunctions, and comets; **Adam Clayson**, uses a 30 inch Dobsonian to complete his Herschel 400 list and is such a skilled observer that he can find numerous Deep Sky Objects, like Stephan's Quintet, without a star map; **Rick Beno**, using his PlaneWave CDK 24, which is housed in the most beautiful observatory at ASV, produces wonderful celestial portraits of deep sky objects; and then, there is **Jim Algots**, a dedicated photometry enthusiast who was actively attempting to solve a celestial mystery that only he had witnessed.

Jim Algots was one of the early people to embrace this concept of an astronomer's village. He built his hacienda, observatory, and workshop on a 4 acre site at the SW corner of the village. Jim's site provided him with an unobstructed view of the entrance to Cave Creek Canyon and the Chiricahua mountains. Jim was highly regarded by all ASV residents and he regularly assisted others with their observatory constructions or home maintenance projects. So, when Paula and I initially came to ASV, the first person to visit and welcome us to the village was Jim Algots. We enjoyed Jim's company and, over the years, we shared numerous meals, astronomy discussions, observing sessions, and yearly travels to many of Arizona's natural attractions. When we first met him we were curious about his motivation to settle, by himself, in this remote astronomer's village beside the SE Arizonan Chiricahua mountains. He had an interesting story that began before he came to ASV.

All amateur astronomers can relate to a singular astronomical experience that kindled their fascination with, and love of, observing the heavens. For **myself**, it was my first view of Saturn's rings; for my wife, **Paula**, it was her first experience of a total solar eclipse; for **David Eicher**, the Editor of Astronomy magazine, it was his first sight of the globular cluster, M13; and, for **Leslie Peltier**, perhaps the world's greatest amateur astronomer, it was his childhood discovery of the Pleiades followed by his 1910 viewing of Halley's Comet. For **Jim Algots**, the star journey that brought him to ASV began with his naked eye observation, on two separate occasions, of a dramatic stellar brightening within the boundaries of Lyra. Each brightening lasted a few seconds and Jim thought he had witnessed a new class of variable stars but, to his frustration, he could only remember the approximate location and magnitude of the luminous outburst.

Jim's scientific training as a chemical technician dictated his methodic approach to solving the mystery. He would build and equip an observatory and then use it to pursue a systematic, photometric study of stars within the borders of Lyra. His hope was that his regular photometric monitoring of the Lyra area would reveal an undocumented variable star, one that might even be the source of the dramatic brightening he had previously observed.

Jim Algots' Split-Roof Research Observatory is almost finished

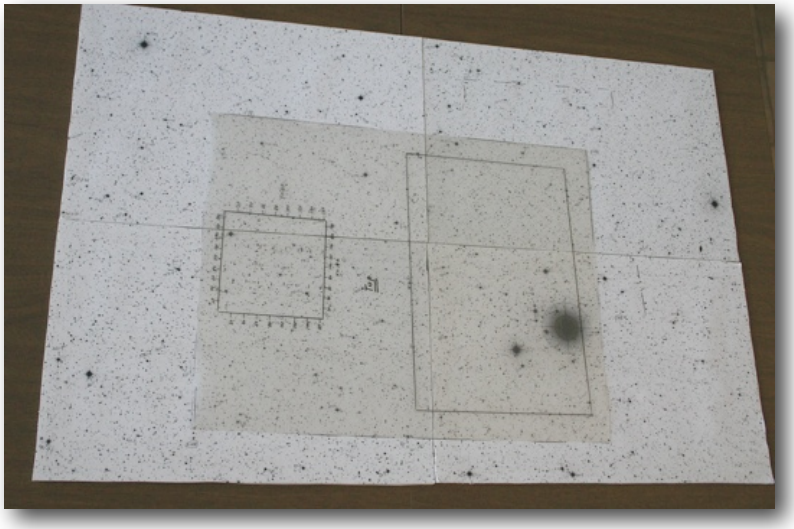
Jim began his investigation by recording calibrated images of various Lyra star fields which he took with a dedicated CCD camera attached to a Meade 12 inch SCT. He produced a large map of his selected star fields which he then placed beside his control computer. Using standard stars, that were recognized as not being variable, he would measure their magnitudes at different times to determine the sensitivity of his equipment and define his observational error bars.

He was hoping to find an undocumented variable star whose light variations were not masked by the measurement errors of his equipment. He continued this approach for a number of years but, alas, he was unable to find his new variable star. Any brightness variations he recorded either instrument errors, located within the error bars of his equipment or the normal pulsations of scientifically recognized variable stars.

Above: *Jim stands beside his Meade 12 inch S*

Jim and I discussed many alternate explanations for the brightening phenomenon he had observed originating from the Lyra star field. We listed everything from aircraft and satellite reflections, through unusual atmospherics, to point meteor bursts and even extreme events, like gamma ray bursts. He had considered them all but, in the end, was still left with his "new variable star" hypothesis. To his frustration, nature remained silent, and Jim never saw the outbursts again. His meticulous search had come up empty. In the last few years, after the many negative observational results, Jim's enthusiasm waned and he abandoned his photometry project.

I think that one other factor affecting Jim's decision to suspend his own photometric survey was the planned robotic sky surveys. He talked a number of times about this new technology and mentioned, in particular, the planned Large Synoptic Survey Telescope (LSST) project. First light is expected in 2019 and first scientific light is expected to start in 2021 and the project will run for 10 years. This advanced telescope will have an aperture of 8.4 metres. It will be located in northern Chile, have a telescopic field of view of 3.5 degrees (7 full moons), and image the entire sky every 3 days in incredible detail. This survey will produce 100,000 real time updates a night. Its data stream should reveal everything from dwarf planets in the Kuiper Belt, the variable flickering of stars, fast moving asteroids closing in on Earth, discover new novae and supernovae, and measure gravitational lensing. This new technology will produce a quantum leap in celestial data acquisition.



Above: *Jim's Lyra Field Star Guide for his Photometry Investigation*

Below: *Jim Algots at his Computer in his Arizona Sky Village Hacienda*

Jim believed that this LSST telescope would make obsolete any attempts by amateur astronomers, using their own equipment, to discover new comets, Earth-crossing asteroids, variable stars, or supernovae. Amateur astronomers, rather than trolling the celestial depths with their own equipment, will be reduced to mining the huge reams of data produced by the LSST, much like some amateurs today who help to process the data from the Hubble Space Telescope. Jim believed that, if a new type of variable star resides within the confines of Lyra, and if it has the properties he observed on those two occasions, then the LSST data stream will discover it and solve the mystery. He would wait.

Then, on December 27th, 2014 we received an email from Fred Espenak with the sad news that Jim Algots had passed away on Boxing Day, December 26th. Jim was in his 76th year. Jim Algots had recently put his ASV hacienda up for sale and he hoped to move to Oregon to be closer to his two daughters and spend his last years beside the ocean.

His unexpected passing is a reminder to all of us that our life is finite and we should take delight in our families and friends and enjoy the beauty, wonder, and mystery of the natural world. ASV will certainly be different without him and he will be missed by everyone who knew him. Jim Algots (Apr 5, 1939 - Dec 26, 2014) was buried in the Paradise Cemetery located a short distance from Portal, AZ.

His spirit is among the stars now.

Cellphone Astrophotos: some steps forward...

Lorraine R. has done some cell phone imaging that readers might find interesting. She writes:
"We were gifted with an iOptron cellphone adapter so I gave it a try on one of the full moon nights when there was a moon halo and thin cloud cover. I was pleased with the results, for my relatively basic cellphone. I was using my 5" Celestron. (Dec 8)"

Exposure details provided by Lorraine:
Focal length = 2.79 mm, aperture 2.6. [f/2.6? -ed]
Exposure = 1/30, ISO 200 (Image 1) ISO 100 (image 2).
These two were done on Night setting, but Lorraine tried Auto as well. Lorraine did a little bit of editing with the phone's available options.

She adds:
"I had also tried a few using the moon filter on the telescope. For some reason those were fuzzier than the others. It was a fun experiment. I'll have to try again on a clearer night, when the moon is in a smaller phase. And next...see if my phone can capture Jupiter."
Lorraine

A blogger who calls himself a "random Canadian" has done some incredible work with cellphone astrophotography and he shares his experiences on his blog at the link below. if you want to see what can be done (including long exposure imaging of deep sky objects) make sure you have a look at the link provided. You will be amazed!

https://canadianastronomy.wordpress.com/2013/03/04/smartphone-astrophotography-how-to-photograph-the-moon-planets-with-your-phone/

Canadian Astronomy is a website written and maintained by Andrew Symes of Ottawa, Ontario. Follow him on Twitter: @failedprotostar and see his astronomical images on Flickr: https://www.flickr.com/photos/41133015@N00/

CANADIAN ASTRONOMY

Below: Cellphone image of Saturn taken by Andrew Symes, the "random Canadian Astronomer" using techniques described at the "Canadian Astronomer" link at left.

Recommended App: NightCap

Features:
Long exposure imaging
Manual exposure control
Night Mode
Light Booster
Grain reduction
Low Light Video
Ultra Long Exposure Mode
HQ Jpeg/Tiff support

http://www.nightcapcamera.com/

'Lost' 2003 Mars Lander Found by Mars Reconnaissance Orbiter

The Beagle 2 Mars Lander, built by the United Kingdom, has been thought lost on Mars since 2003, but has now been found in images from NASA's Mars Reconnaissance Orbiter.

A set of three observations with the orbiter's High Resolution Imaging Science Experiment (HiRISE) camera shows Beagle 2 partially deployed on the surface of the planet, ending the mystery of what happened to the mission more than a decade ago. They show that the lander survived its Dec. 25, 2003, touchdown enough to at least partially deploy its solar arrays.

Beagle 2 hitched a ride to Mars on the European Space Agency's long-lived Mars Express mission. It was a collaboration between industry and academia designed to deliver world-class science from the surface of the Red Planet.

"I am delighted that Beagle 2 has finally been found on Mars," said Mark Sims of the University of Leicester, U.K. He was an integral part of the Beagle 2 project from the start, leading the initial study phase and was Beagle 2 mission manager. "Every Christmas Day since 2003 I have wondered what happened to Beagle 2. My Christmas Day in 2003 alongside many others who worked on Beagle 2 was ruined by the disappointment of not receiving data from the surface of Mars. To be frank I had all but given up hope of ever knowing what happened to Beagle 2. The images show that we came so close to achieving the goal of science on Mars.

HiRISE images initially searched by Michael Croon of Trier, Germany, a former member of the European Space Agency's Mars Express operations team, provide evidence for the lander and key descent components on the surface of Mars within the expected landing area of Isidis Planitia, an impact basin close to the equator.

Subsequent re-imaging and analysis by the Beagle 2 team, the HiRISE team and NASA's Jet Propulsion Laboratory, Pasadena, California, have confirmed that the targets discovered are of the correct size, shape, color and dispersion to be Beagle 2. JPL planetary geologist Tim Parker, who has assisted in the search and processed some of the images said, "I've been looking over the objects in the images carefully, and I'm convinced that these are Beagle 2 hardware."

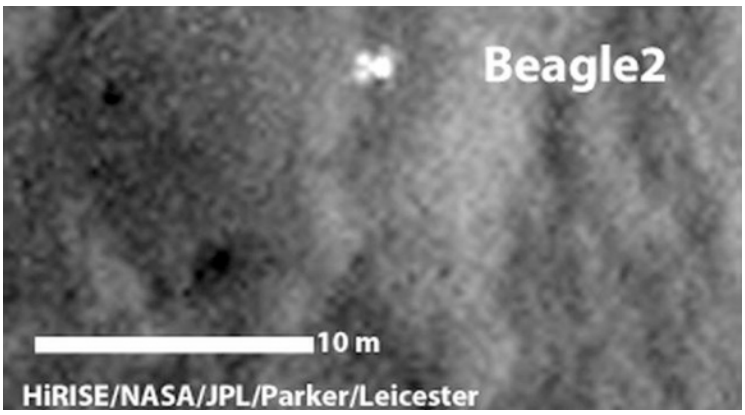
Analysis of the images indicates what appears to be a partially deployed configuration, with what is thought to be the rear cover with its pilot/drogue chute (still attached) and main parachute close by. Due to the small size of Beagle 2 (less than 7 feet, or 2 meters across for the deployed lander) it is right at the limit of detection of HiRISE, the highest-resolution camera orbiting Mars. The targets are within the expected landing area at a distance of about three miles (five kilometers) from its center.

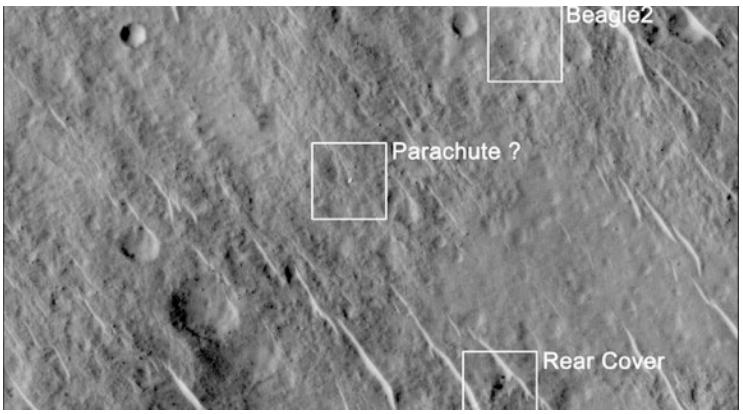
"I can imagine the sense of closure that the Beagle 2 team must feel," said Richard Zurek of JPL, project scientist now for Mars Reconnaissance Orbiter (MRO) and previously for NASA's still-missing 1998 Mars Polar Lander. "MRO has helped find safe landing sites on Mars for the Curiosity and Phoenix missions and has searched for missing craft to learn what may have gone wrong. It's an extremely difficult task, as the craft are small and the search areas are vast. It takes the best camera we have in Mars orbit and work by dedicated individuals to be successful at this."

Jet Propulsion Laboratory
California Institute of Technology

HiRISE is operated by the University of Arizona, Tucson. The instrument was built by Ball Aerospace & Technologies Corp. of Boulder, Colorado. The Mars Reconnaissance Orbiter Project is managed for NASA's Science Mission Directorate in Washington, by JPL, a division of the California Institute of Technology, Pasadena. For more information about HiRISE, visit:

http://hirise.lpl.arizona.edu





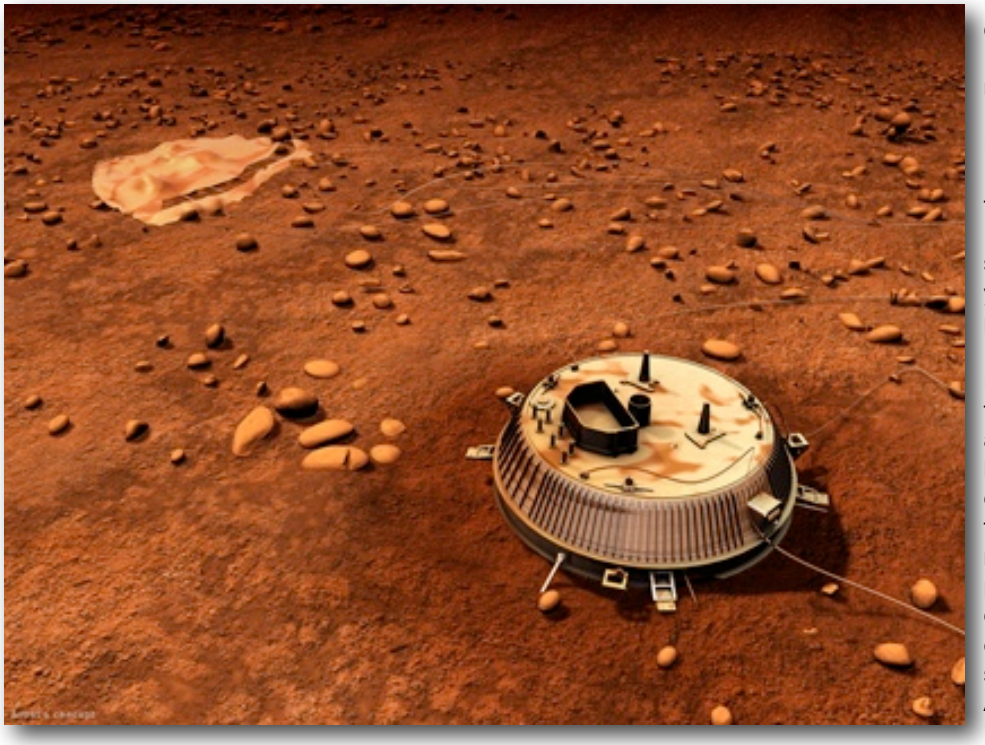
Media Contact
Guy Webster
Jet Propulsion Laboratory, Pasadena, California
818-354-6278
guy.webster@jpl.nasa.gov

A short (but interesting!) video about the discovery is available from the JPL site here:

http://www.jpl.nasa.gov/news/news.php?release=2015-020&utm_source=iContact&utm_medium=email&utm_campaign=NASAJPL&utm_content=mro20150116

Huygens landed on Titan a decade ago

Ten years ago (Jan 14, 2005) an explorer from Earth parachuted into the haze of an alien moon toward an uncertain fate. After a gentle descent lasting more than two hours, it landed with a thud on a frigid floodplain, surrounded by icy cobblestones. With this feat, the Huygens probe accomplished humanity's first landing on a moon in the outer solar system. Huygens was safely on Titan, the largest moon of Saturn.



The hardy probe not only survived the descent and landing, but continued to transmit data for more than an hour on the frigid surface of Titan, until its batteries were drained.

Since that historic moment, scientists from around the world have pored over volumes of data about Titan, sent to Earth by Huygens -- a project of the European Space Agency -- and its mothership, NASA's Cassini spacecraft. In the past 10 years, data from the dynamic spacecraft duo have revealed many details of a surprisingly Earth-like world.

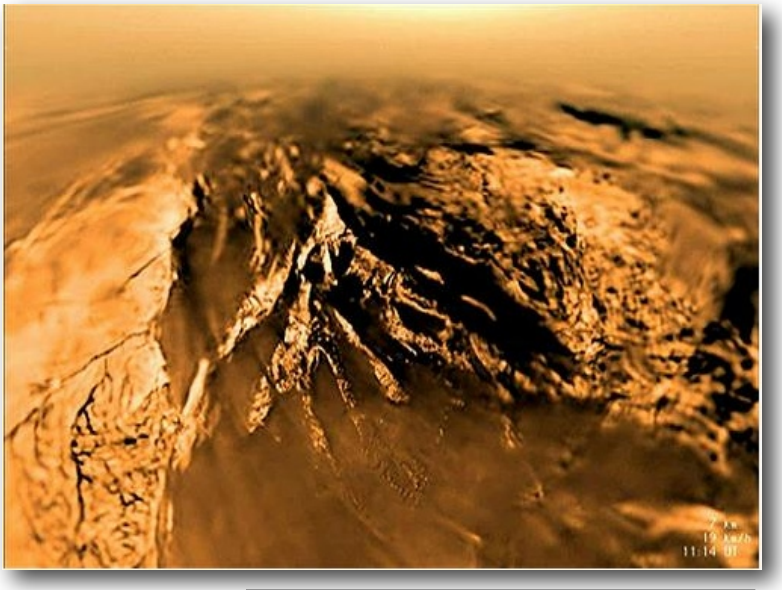
In addition to the technical wizardry needed to pull off this tour de force, international partnerships were critical to successfully delivering the two spacecraft to Saturn and Titan.

"A mission of this ambitious scale represents a triumph in international collaboration," said Earl Maize, Cassini Project manager at NASA's Jet Propulsion Laboratory in Pasadena, California. "From the mission's formal beginning in 1982, to Huygens' spectacular landing 23 years later, to the present day, Cassini-Huygens owes much of its success to the tremendous synergy and cooperation between more than a dozen countries. This teamwork is still a major strength of the project as the Cassini orbiter continues to explore the Saturn system," Maize said.

A collection of Huygens' top findings is available from the European Space Agency at: http://sci.esa.int/huygens-titan-science-highlights .

More information about Cassini is available at the following sites:
http://www.nasa.gov/cassini
http://saturn.jpl.nasa.gov .

Watch Huygens Descent Movie



This movie (link bottom right) was built with data collected during the 147-minute plunge through Titan's thick orange-brown atmosphere to a soft sandy riverbed by the European Space Agency's Huygens Descent Imager/Spectral Radiometer on Jan. 14, 2005.

In 4 minutes and 40 seconds, the movie shows what the probe "saw" within the few hours of the descent and the landing. At first, the Huygens camera just saw fog over the distant surface. The fog started to clear only at about 60 km altitude, making it possible to resolve surface features as large as 100 m. Only after landing could the probe's camera resolve the little grains of sand. The movie provides a glimpse of this huge change of scale.

The Huygens probe was delivered to Saturn's moon Titan by the Cassini spacecraft. The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for NASA's Science Mission Directorate, Washington, D.C. The descent imager/spectral radiometer team is based at the University of Arizona, Tucson.

For more information about the Cassini-Huygens mission visit http://saturn.jpl.nasa.gov/home/index.cfm

Image Credit:
ESA/NASA/JPL/University of Arizona

http://saturn.jpl.nasa.gov/multimedia/videos/movies/pia08118-320-cc.mov

Click on the link above for a very interesting descent onto Titan's surface with Huygens

The Theory of Everything

Jan 15, 2015

A biopic of Stephen Hawking reviewed by **Tushna Commissariat**
Taken from the January 2015 issue of *Physics World*

Making a biographical film about someone who is still alive is tricky, especially when the subject is both famous and intensely guarded about his private life. But with *The Theory of Everything* – a biopic of the physicist Stephen Hawking that focuses on his relationship with his first wife Jane, based on her memoir of their 30 years together – director James Marsh seems to have pulled it off. The film starts in 1963, when Hawking (played by Eddie Redmayne) is a cosmology student at the University of Cambridge. Already determined to find a "simple, eloquent explanation" for how the universe works, the young Hawking comes across as both intelligent and awkward – a combination that intrigues and charms Jane Wilde, an arts student he meets at a party. Early in their courtship, Hawking is diagnosed with motor neurone disease and told that it will kill him in about two years. Despite this bleak prediction, the pair get engaged and initially it seems they can navigate the troubled waters of illness (and rising fame) together. As time passes and Hawking's physical limitations become more significant, however, stresses take their toll and previously stiff upper lips begin to wobble, especially after an emergency tracheotomy causes Hawking to lose his voice. *The Theory of Everything* is, in the main, a love story, but it is no saccharine drama, and Marsh deliberately steers away from the maudlin. While the character of Jane Hawking (played by Felicity Jones) appears slightly naive at the start, she comes into her own as the film progresses, rationing her tears as she tries to cope with the burdens of raising a family and dealing with her husband's increasing fame, as well as the looming shadow of his illness. The film is not without its lighter moments, though: when Hawking gets a new computerized voice, one of the first things he says with it is "Ex-ter-minate!" While strong on Hawking's humanity (and humour), *The Theory of Everything* has less to say about the physics research that made him famous. A few scenes do show him working on his theories and presenting them to ever-increasing audiences of friends and colleagues, but these merely skim the surface. While it seems odd to give so little time to the source of Hawking's celebrity, Marsh was clearly aiming to depict Hawking the man, rather than Hawking the brilliant scientist. In this, he succeeds, with a subtle, restrained portrait of the lives of some very clever people.

The Theory of Everything is a 2014 Universal Pictures/ Focus Feature, a Working Title production.

[Rececca and I saw this film recently and we both loved it. It was a love story but had enough science to keep me happy and, at the same time, give Rebecca a good feel of the world of theoretical physics and cosmology. If Eddie Redmayne does not win Best Actor for this portrayal, there is no sanity in the Academy Awards committee. Redmayne does an incredible job of portraying emotion in spite of Hawking's illness and he does it with just his eyes! A truly remarkable performance.-ed]

Unique astronomical event captured by U of M team

NOVEMBER 25, 2014 —

Last week, a team of amateur astronomers at the Glenlea Astronomical Observatory south of Winnipeg managed to capture a video image of an asteroid passing in front of a star. The astronomical event, called an occultation, is rare and difficult to observe, and the astronomers' ability to observe it required a great deal of skill — so much skill that an international astronomy magazine profiled their work online.

Jennifer West is an instructor and Ian Cameron is planetarium supervisor with the department of physics and astronomy, Faculty of Science; Jay Anderson is editor-in-chief of the *Journal of the Royal Astronomical Society of Canada* and former instructor in astronomy at the U of M. The trio captured an excellent video of the asteroid Juno as it eclipsed the 7th-magnitude star SAO 117176 (aka HIP 43357) on November 19, 2014. [see Sky Events Nov SGN -ed]

Juno is a one of the largest asteroids discovered by astronomers, with an average diameter of about 250 km. It orbits the Sun between Mars and Jupiter. Manitoba was the only location on Earth with a clear sky where such an observation was possible. The team recorded the event using the U of M's observatory's 16-inch telescope and an Apogee AP47 CCD camera. The entire occultation lasted only about 20 seconds.

Sky and Telescope magazine noted: "Precise timing of the disappearance and reappearance of the star from multiple locations help astronomers build an accurate shape profile of the asteroid. And in rare cases, tiny moons of these larger asteroids have been discovered during occultations when the star unexpectedly winked out twice."

You can get a look at the video here: https://www.youtube.com/watch?v=-8nV4ZhQPl8#t=87 The Occultation occurs at 0:34 mark of video.

Canis Major (CMa)

α Canis Majoris - Sirius
β Canis Majoris - Murzim
γ Canis Majoris - Muliphen
δ Canis Majoris - Wezen
ε Canis Majoris - Adara
ζ Canis Majoris - Furud
η Canis Majoris - Aludra

Sirius, the brightest star in the sky (magnitude -1.47), is the most conspicuous star in this constellation. It is easily located by following downward the line connecting the three stars in the Belt of Orion. Sirius is the nearest star to the sun visible to the naked eye in the northern latitudes, being but 8.7 light years distant. It has a white dwarf companion, a star so dense that one cubic inch weighs a ton. M 41 is an open cluster visible to the naked eye and is a fine sight in binoculars. Also observe with binoculars the fine field of stars between δ and o_1 Canis Majoris; look for a very red star in this field.

DOUBLE STARS [Note: two digits in bold mean negative Decl.]

	Mag.	Sep (s)	Location	Remarks
α	-1.47-8.4	11	064317	
ε	1.6-9.0	8	065729	Good contrast.
μ	5.2-8.0	3	065514	White-Blue.
ν1	5.8-7.9	17	063419	
H3945	5.0-7.0	27	071523	Orange-Pale Blue; beautiful

MESSIER OBJECTS

	Mag	Location	Remarks
M 41	4.6	064521	Open Cluster. Beautiful in small scope, red star in centre.

Other Objects of Interest in Canis Major

NGC 2360 - Open Cluster. Location 073414.
R Canis Majoris - A short period (1d 3h 15 min) variable, magnitude range 5.9-6.7. Location 071716.

Lepus (Lep)

α Leporis - Arneb β Leporis - Nihal

Lepus is located at the feet of Orion, the Hunter; its four brightest stars all of the 3rd magnitude, form an easily identified trapezoidal figure. Four smaller stars in a rough rectangle (λ, k, ι and ν-Leporis) represent the long ears of the hare. γ-Leporis is a fieldglass double.

DOUBLE STARS [Note: two digits in bold mean negative Decl.]

	Mag.	Sep (s)	Location	Remarks
α	2.7-12.0	36	053118	Yellow-Grey.
β	2.8-9.4	3	052721	
γ	3.8-6.4	95	054222	Yellow-Garnet.
k	4.5-7.5	2.5	051113	Yellow-Blue.
H3752	5.5-6.7-9.0	3-59	052025	Triple.
H3780	--	--	053718	Beautiful multiple star; v. fine in small scopes

MESSIER OBJECTS

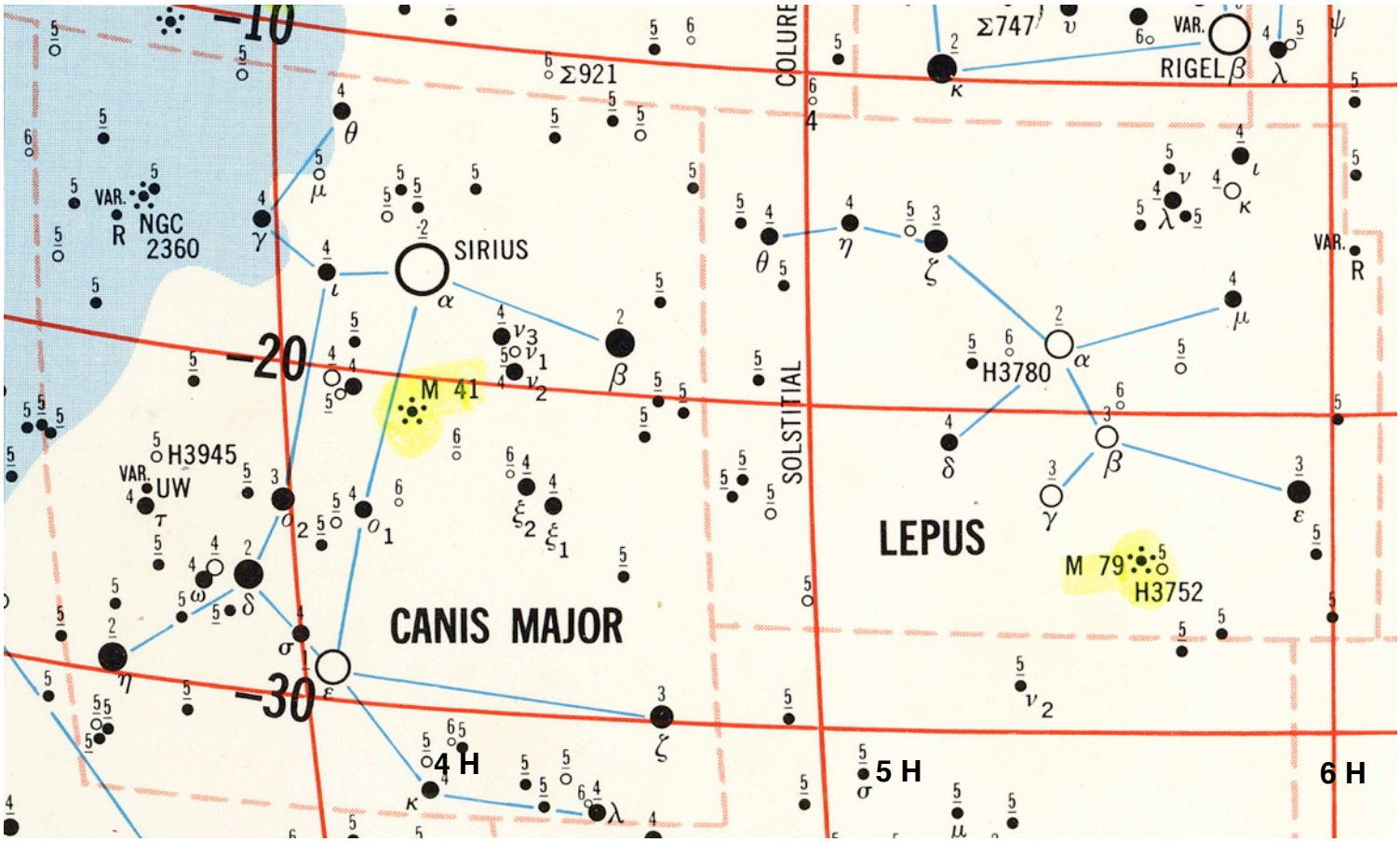
	Mag	Location	Remarks
M79	7.9	052225	Globular Cluster, fairly bright, very beautiful

Other Objects of Interest in Lepus

R Leporis - Hind's "Crimson Star," a long period var. (436 days), magnitude range 6-11. Observe at maximum; it appears blood-red in a telescope. Location 045715.

Star magnitudes are labeled as numerical values above (or near) the star. Underlined values are half magnitudes. Larger star dots denote brighter stars.

Chart Legend
- Star Location
- Double Stars
- \+ Nebulae
- ★ Clusters
- Variable Stars
Var



Date:		Times given in EST (24 h clock)
Feb 03	Tue	18:09 **FM** rises 5:42 pm EST locally
06	Fri	01:25 Moon at Apogee: 406 155 km
		12:00 Jupiter at Opposition (magnitude = -2.57)
Zodiacal Light visible in W after sunset for next 2 weeks		
11	Wed	10:50 **LQ Moon** rises locally at 12:31 am EST
12	Thu	19:10 Saturn 2.1°S of Moon
17	Tue	01:20 Mercury 3.5°S of Moon
18	Wed	17:47 **NM** rises locally at 6:47 am EST
19	Thu	02:29 Moon at Perigee: 356 992 km
20	**Fri**	**19:56 Venus 2.0°S of Moon**
		20:28 Mars 1.5°S of Moon
21	**Sat**	17:42 Uranus occulted by Moon Reapp. 18:48 EST
24	Tue	11:00 Mercury at Greatest Elong: 26.7°W
25	Wed	12:14 **FQ Moon** rises locally at 11:13 am EST
		18:00 Aldebaran under 1° from Moon

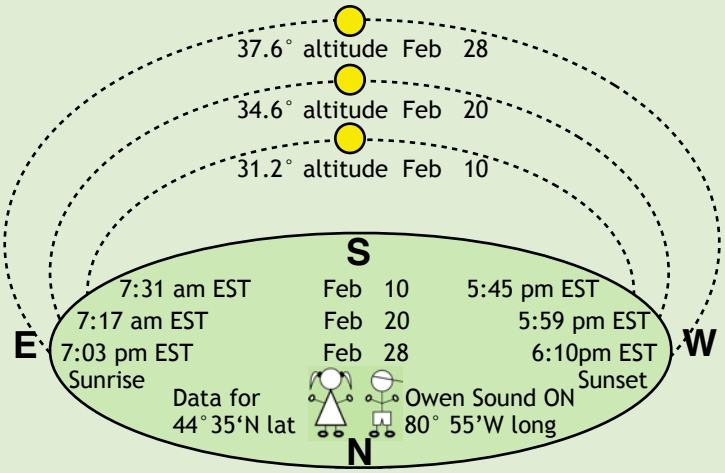
Special Events

On Saturday, Feb 21 Uranus (mag. 5.9) will be occulted by the crescent Moon with the disappearance at 5:49 pm EST and reappearance at 6:42 pm EST. This is a viewing night at the Fox for members/guests so come a bit earlier to catch this event.

Planets

MERCURY, slipped behind the Sun in late Jan and now is visible in the morning sky. By Feb 24 it is farthest from the Sun and starts back again. A thin last crescent Moon is 5° from Mercury on Feb 17. **VENUS,** (-3.9) slides past Neptune (less than 1°) Feb 1 and carries on towards Mars which it passes at less than 0.5° on Feb 21. But then on Feb 20 the Moon joins Mars and Venus for a photo op (see Special Events) **MARS** (mag. 1.2) continues moving eastward in the sky and stays more than 20° above the western horizon all February. Look for it only 26 minutes of arc from Venus on Feb 21. **JUPITER**, (-2.6) reaches opposition on Feb 6 and is in the sky all night long. Good viewing all month. **SATURN,** (mag. 0.5) rises by 1:30 am at month end. **URANUS,** (5.8) and **NEPTUNE,** (7.8) are evening sky objects with Neptune going behind the sun by month end but not before Venus passes closely (50 min of arc separation) on Feb 1. Uranus sets by 9 pm. Both **asteroid, Vesta (7.1)** and dwarf planet, **Ceres (8.3)** are close to the dawn Sun and difficult to view this month. **Ceres, Vesta** and **PLUTO** (mag. 14) charts will be on the BAS website once those objects become more easily visible.

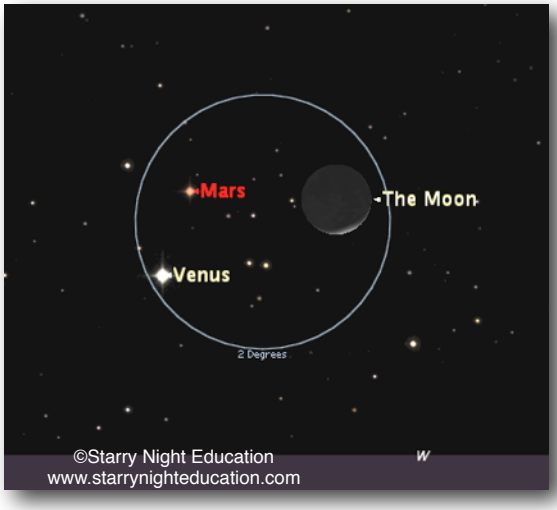
The diagram below gives the sunrise/sunset times and the Sun's altitude for February 2015. The Sun continues rising in elevation.
The February moon phase graphic below shows lunar phases for each night of the month. Times of moonrise for NM, FQ, FM and LQ are given in the Sky Calendar listing at left.



Evening Planets

Feb 20: Mars, Venus, Moon triangle

The western sky after sunset is where all the planetary action is this winter. Jan 10 saw Venus and Mercury making a close approach to each other and this month it is Venus and Mars. The diagram below shows the view at 8:15 pm EST on Feb 20 just before the group of two planets and crescent Moon disappears below the horizon. The sky should be good and dark for more than an hour, so you have plenty of time to go out and look. At time of sunset, the triangle is about 24° above the horizon. The circle in the diagram is 2° across and all three will fit nicely inside it. Mars is a tiny 4.3 arc-sec across (mag. 1.26), Venus is 12 arc-sec and mag. -3.95 and the Moon is a whopping 1980 arc-sec across (33 min.) and outshines everything else but the Sun at mag -9.8. Take pictures! Send to SGN! Please, and Thank You!



By permission Univ. of Texas McDonald Obs.

Feb 2015

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

BAS Member Loaner Scopes

Solar H-alpha scope now available.

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

One 12-inch Dob available.

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

SGN Classified Ads Section

(Now also on our website)

FOR SALE: Meade Lightbridge 16" Dobsonian

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

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

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

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

FOR SALE: Canon EOS T-adapter

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

FOR SALE: Televue Pronto

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

Price reduced to $600 !

SALE pending!

One-Minute Astronomer

The Bucket List for Backyard Stargazers shows you how, where, and when to see 11 of the **most extraordinary astronomical sights and events** that every stargazer– every person– should see at least once in their lives before packing up their telescope for the last time.

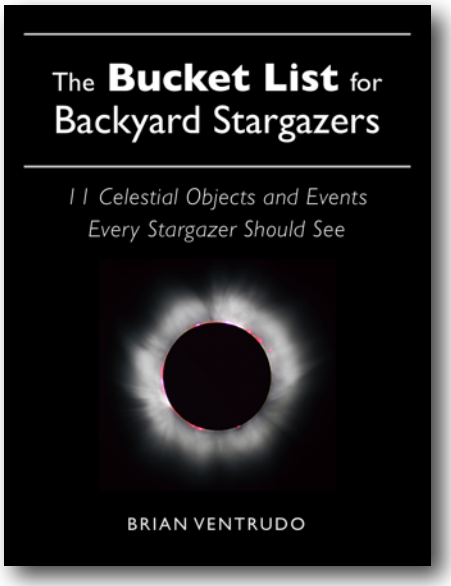
The book is **for all stargazers**, but it's especially aimed at the casual stargazer, one who may not have a big telescope or a lot of experience, but who has the curiosity and ambition to see some of the most beautiful, and in some cases, fleeting sights in all of nature. To see some of these sights, you need a simple pair of binoculars or a small telescope. Some require travel or good timing and luck. And a few require you to simply look up without any optical aid at all.

Once you see these 11 sights, then whatever else happens in your life, you can be assured **you've seen some truly remarkable things** that few people– even the most celebrated professional astronomers– ever get to see.

The book is available in multi-media format from Apple's iBookstore, in standard e-book format from Amazon's Kindle store, and in PDF format (choose the one that works best for you). In all three formats, the cost of *The Bucket List for Backyard Stargazers* is just **$2.99** (US dollars), about the cost of a coffee and a donut, but much better for you…

http://oneminuteastronomer.com/bucket-list/

Brian Ventrudo, a professional physicist, is based in Ottawa and pursues his astronomy hobby by publishing a website for hands-on and armchair astronomers. Subscribe to his very informative newsletter here: http://oneminuteastronomer.com/

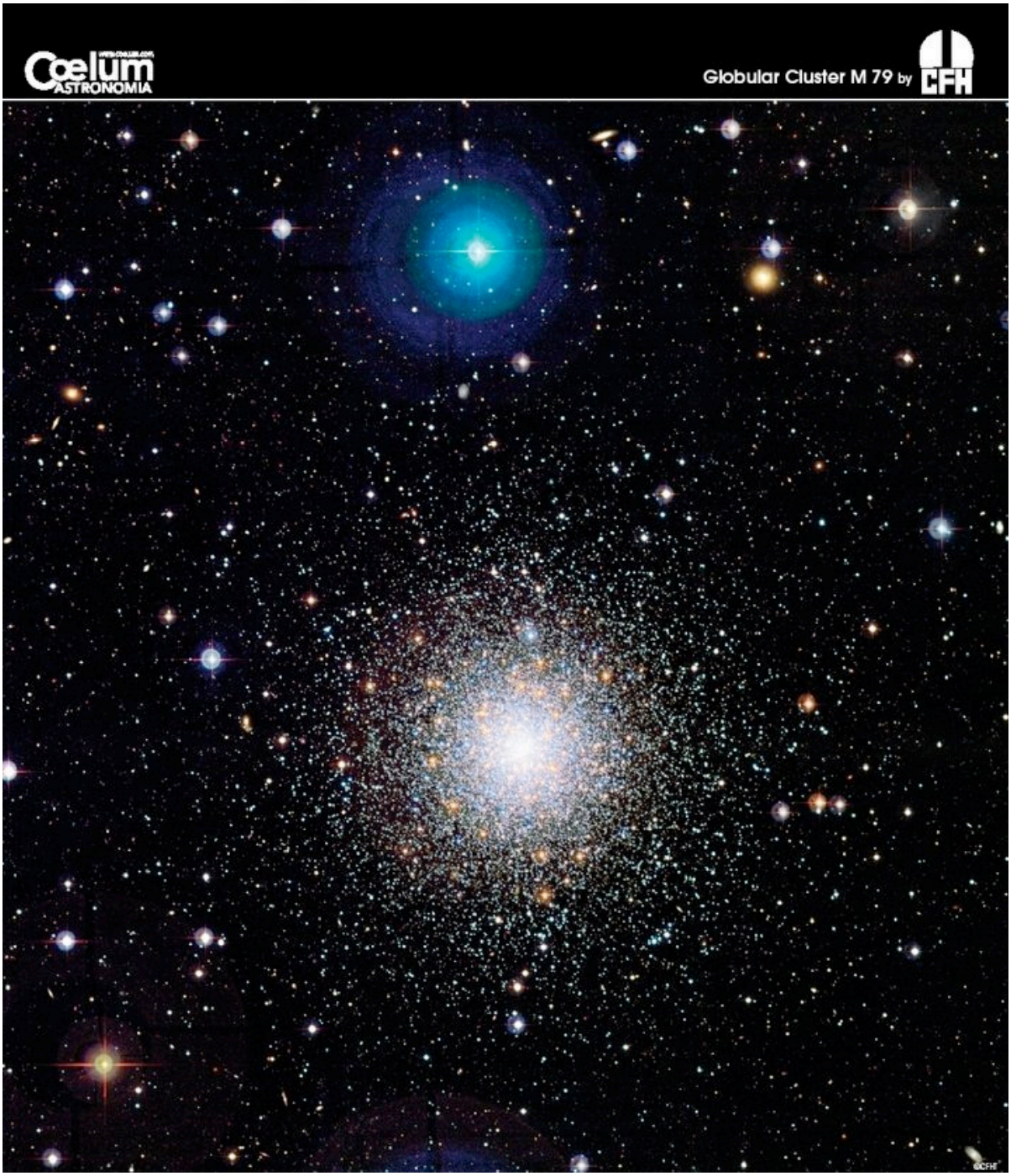


Globular Cluster M79

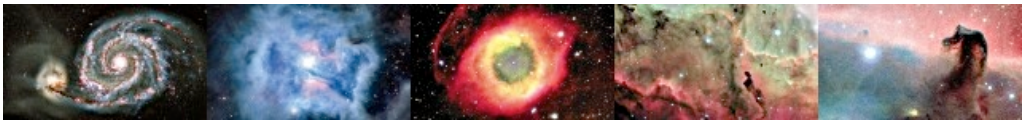
The Canada-France-Hawaii Telescope in Hawaii is one of the most productive instruments in spite of its "smaller" aperture of 3.6 m. The observatory is located atop the summit of Mauna Kea, a 4200 meter, dormant volcano located on the "big" island of Hawaii. The CFH Telescope became operational in 1979.

This image of M79 was featured in March 2012 and was taken by MegaCam, a array of 36 CCD detectors with a total 340 MegaPixels resolution (0.18 arcsecond pixels) and a 1°x1° field of view or enough to cover four full Moons. The blue star in the image at top centre is 9.43 magnitude star TYC6475-187-1.

On Dec 28, Comet Lovejoy C/2012Q2 passed M79 at a separation of a mere 1/8th° or about 8 minutes of arc. TYC6475-187-1 is about 9 minutes of arc away but on the side opposite to the nucleus of Lovejoy. Have a look at Spaceweather.com in the Realtime Comet Gallery for Dec 28 for lots of great images of the close pass of C. Lovejoy to M79.



Astronomy Images of the Month & Mauna Kea Photography



CFHT's spectacular images of the heavens, the fruit of a collaboration with Coelum Astronomia, have been used month after month since 2002 to produce a yearly wall calendar as well as an Image of the Month for the CFHT web site. Some of the best CFHT pictures have been edited as posters, seven large (27x38in) and ten medium (19x27in), which can be ordered online from CFHT. Click on the banner above to access the current Image of the Month, the archive of all past Images of the Month, photos of Mauna Kea and Hawaii, and more!

Also, have a look at ***Hawaiian Starlight*** a DVD of videos and images created by Jean-Charles Cuillandre and available for purchase here: http://www.cfht.hawaii.edu/HawaiianStarlight