



Astronomy News for Bluewater Stargazers
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Nov 2013 Contents

- p 1: Chris Hadfield: Awesome Performance
- p 2: BAS Events; From the "Top"
- p 3: Tales of Leaky Spacesuits
- p 4: Hybrid Canadian Satellite Launched
- p 5: Nature of Dark Matter in Universe
- p 6: Quetican FoV: Comet ISON "just passing through"
- p 7: Comet ISON Viewing Guide
- p 8: Hybrid Total Solar Eclipse (over Africa) Nov 3
- p 9: LARGE fragment of Chelyabinsk fireball recovered
- p 10: Constellations: Triangulum and Ares
- p 11: Sky Calendar: Nov Sky Events
- p 12: Classified Ads; EXPLODING COMET! (LINEAR)



In spite of the rather cryptic title above, Hadfield gave an incredible performance for a "normal person" as opposed to a rock star. Although, he does have a fair share of musical talent and some great connections in Ed Robertson, with whom he co-wrote the song ISS (Is Somebody Singing?). The two numbers that started the show, "Space Oddity" and "ISS (Is Somebody Singing?)" have become Youtube classics reaching a total of 19 million plays to date. But the best part of the talk was Hadfield's personal comments about his life as an astronaut. The story about tearing up to the point of blindness in his spacesuit due to the de-fogging chemical used on the visor illustrated not only the dangers in space, but also the "right stuff" that all the astronauts possess. See more on page 3 about water in Luca Parmitano's spacesuit just a few months after Hadfield's return.



Cmdr. Hadfield explains why the Earth has fields -gravitational and magnetic to a young man who was interested in the answer, but who had trouble sorting it out. It was the toughest question asked during the evening. Partly because the existence of fields has been observed and their behaviour well-characterized, but where they come from is not a question many physicists ask or even attempt to answer. Hadfield got it right when he said, "They just exist -we don't know why." Maybe the young man will go on to provide an answer some day.

Chris Hadfield: An Inspiration by John H.

Cmdr. Chris Hadfield has come a long way from the 9 year old sitting in a cardboard box pretending he was onboard an Apollo spaceship. Along the way, he has been a CF-18 jet jockey, a top test pilot, flew two Shuttle missions, the Chief of Robotics for the NASA Astronaut Office as well as commander of the ISS on his last mission from Dec 2012 to May 2013. In spite of all these accomplishments, he is down-to-earth enough to admit he wore diapers with red and blue astronauts on them when he had his space-walking suit on. (All astronauts do.)

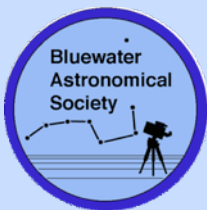
Of all the adventures and opportunities to do the exciting things he has done, he describes his spacewalks on the ISS as the most thrilling part of his career. His description: "On one side is the ISS, below is the Earth, and on the other side is the Universe." He also revealed what I think is the secret feelings of a lot of people that have had similar fantastic experiences: "This is just sooooo much fun!"

Here is a guy who has worked his butt off to use his talents to get him someplace that we all would like to be. And to his credit, he does not keep it to himself, using every means at his disposal to share the experience with others. Bravo, Chris, you are truly an outstanding person and we are proud to be able to claim you as Canadian!

"Gravity": no comparison A week after Hadfield's performance, I had a chance to see the 3-D movie "Gravity" starring Sandra Bullock and George Clooney. It re-inforced my general rule never to pay money (\$21 this time) to see Hollywood's version of space movies. (The only exception was Apollo 13 which was basically a documentary.) The graphics in "Gravity" are worth the price, but as a space buff, I cannot help but look for inaccuracies in the story. The most glaring one to me was the lack of a backpack on the Russian suit that Bullock's character used to float around outside the space station. Compared to Hadfield's real experience, "Gravity" sucks.

Disclaimer: StarGazer News reports on the activities of the Bluewater Astronomical Society (formerly Bruce County Astronomical Society) but any opinions presented herein are not necessarily endorsed by BAS. See the BAS website at www.bluewaterastronomy.info for up-to-date details relating to BAS events. The BAS weblog is back, with articles of immediate interest written by various BAS members.

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BAS Events for November 2013

- Nov 2 (NM-1) BAS viewing @Fox** ES Fox@dark, backup night Nov 29 (LQ+4)
- Nov 6 Wed BAS meeting** Grey Roots Museum 7 pm
Member's Night presentations
- Nov 10 (FQ) Comet ISON** should be visible in the morning sky (between Mars and Spica) from now on and passes Spica Nov 17/18. Starry Night gives Nov 10 as the time when the comet reaches 5th magnitude. It will decline to 5th magnitude again around Jan 4. Two months of Comet viewing! However, the bright moon will affect the sky Nov 15 to 23 or so. Then it becomes a crescent while the comet swings around the sun Nov 28. Once the comet starts its outward journey, the moon does not interfere until after Dec 15 or so as it rises as a waxing gibbous moon at comet viewing time.

New 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
- Welcome to the new members on exec and
Thank You to those who served in the past!

From the "Top": by Aaron Top pres. BAS

Hey Stargazers! As you all know Comet ISON is on its way towards the Sun and it reaches perihelion (closest approach to the sun) on November 28, 2013. Let's hope we get "The Comet Of The Century". Here is a photo taken October 14, 2013 when it was in conjunction with the red planet Mars and the star Regulus. I was able to locate the comet as well through my 12" dob. It appeared as nothing more than a tiny little fuzz not resolved into anything stunning at that point in its orbit. Doug Cunningham also photographed the comet on October 9. [See Doug's column pg 6 and image pg 7.-ed] As the comet makes its way around the Sun, it will have an exceptionally close pass to the Earth as it shoots out back towards the outer solar system. Stay tuned for more information about the comet in the coming weeks. [Lots in this issue! -ed] I'm sure we will be arranging viewing sessions to observe the comet. November 24 marks a special event as Saturn and Mercury will be near ISON.

Cheers Aaron

Image right: Comet ISON Oct 13, 2013, 4:47 am, focal length 300 mm, f/5.6, ISO 1600, Canon 50D



'I Didn't Think He Would Drown': Comment on Spacesuit Leak During Spacewalk

by ELIZABETH HOWELL on SEPTEMBER 20, 2013 for Universe Today

Safely back on Earth on Sept. 10, astronaut Chris Cassidy happily chatters about his daily trips to the gym — “I feel real solid with my walking”, he says — and cracks one-liners during one of a series of media interviews on Thursday.

“It was such a treat being up there with [Chris] Hadfield, and I think I need to get credit for filming some of those videos,” joked Cassidy in a phone interview from Houston with *Universe Today*. His favorite video with Canada’s Expedition 35 commander? A [remake of David Bowie’s Space Oddity](#) that got props from Bowie himself.

Cassidy’s half-year voyage in space was full of these light moments, such as his [decision to shave his head](#) in homage to his bald crewmate, Luca Parmitano, who arrived on the International Space Station as a part of Expedition 36 on May 29. Weeks later, however, the men’s mood turned serious during a July 16 spacewalk; Parmitano reported water pooling at the back of his head.

“I was watching out when we were face to face outside,” Cassidy said. “Once it got onto his eyebrow hair area, it whipped across the top of his forehead and then sort of slid around his eyeballs. It migrates from hair to hair, and the little wispy hairs around your eyes, kind of, and then it travelled towards his eyelids and eyelashes. That was the scary part.”

Cassidy is [a former Navy SEAL](#) who passed, first try, the grueling “hell week” all recruits go through. In 5.5 days, SEAL trainees get just four hours of sack time while having to move for up to 200 miles.

A veteran of shuttle mission STS-127, Cassidy also accumulated more than 18 hours of spacewalking experience across three excursions. All of his knowledge was brought to bear as he watched the water travelling across Parmitano’s head.

“From my experience in the military, I know bad things don’t get better fast, but they get worse fast. I wanted to get as quickly to the airlock as we could,” Cassidy said. NASA [prudently ended the spacewalk](#) and told Parmitano to head back to the hatch. Cassidy quickly did a cleanup at the work site and followed Parmitano.

“When we left each other at the work site and we had to go our separate ways back, at first I wasn’t too concerned,” Cassidy said. “And then when we left each other, the sun set. It was dark. His comm was going in and out and I could tell from his voice he was getting less and less comfortable ... He didn’t have a whole lot of EVA experience, and it was nighttime, which is significant. It was pitch dark. You just have to know your way back, and he couldn’t see that well.”

Back in the hatch, Cassidy and Parmitano communicated through hand squeezes as the water was soaking Parmitano’s communications system. Cassidy carefully watched Parmitano’s mouth to see if the water was getting near there.

“I didn’t think he would drown, to be honest ... but if it got close to his mouth I was going to immediately open the valve that equalizes pressure [inside the hatch.]” Cassidy added that usually, NASA goes slow during repressurization for ear safety and some technical reasons, but this time case he was prepared to flood the compartment if necessary. But it wasn’t. The rest of the crew then opened the hatch and got Parmitano out of his spacesuit as quickly as they could.

“Just from a human interest point of view, it was a lot of water,” Cassidy said. “It was definitely more than a softball or two softballs of water inside the helmet.”

You can read [Parmitano’s blogged account of the spacewalk here](#). The astronaut is currently unavailable for interviews while he is in orbit, and NASA is still investigating the cause — the agency, in fact, also has a parallel investigation to look at spacewalk safety procedures in general. Cassidy attempted to change a filter and do other repairs in orbit, but the leak still happened, [as these videos show](#). More detailed analysis will happen when the spacesuit goes back to Earth on a future SpaceX Dragon cargo flight, Cassidy said.

Cassidy also performed an emergency spacewalk in May when [a coolant leak was discovered on the station itself](#) as Hadfield’s Expedition 35 crew was set to return home. In just days — a typical spacewalk takes at least months to plan — NASA [swiftly implemented a successful fix](#). Cassidy said his work was the easiest bit of all. “All I had to do was go out there and change the pump,” he said. [Hadfield spoke of this at the Sep 28 OSCVI presentation. -ed]

Now back on Earth, Cassidy said he generally feels great from a health perspective. His first set of exercises came [about an hour after landing](#). He was carried into a medical tent and asked to do a quick series: sit in a chair and then stand up for 10 seconds. Lie on the ground for about a minute, then try standing for three minutes.

“My legs got wobbly for fatigue. They weren’t used to holding that weight,” Cassidy said, but observed that he readjusted to Earth’s gravity quickly during his first day back, which was mainly spent flying from Kazakhstan back to Houston.

Read more: <http://www.universetoday.com/104926/i-didnt-think-he-would-drown-spacewalking-crewmember-on-spacesuit-leak/#ixzz2h0EYgtSc>



Luca Parmitano during a spacewalk on July 16, 2013. An hour into the spacewalk, he reported water in his helmet and NASA cut the spacewalk short. Credit: NASA

Successful Launch of CASSIOPE: Hybrid Satellite Mission Carrying Canadian Science and Telecommunications Payloads

Longueuil, Quebec, September 29, 2013 – The Canadian Space Agency (CSA) is proud to announce that Canadian satellite, Cascade Smallsat and Ionospheric Polar Explorer (**CASSIOPE**) was successfully launched today at noon (12:00 p.m. EDT). Lift off took place from the Vandenberg Air Force Base in California aboard a SpaceX Falcon 9 rocket. CASSIOPE is the first Canadian hybrid satellite to carry a dual mission in the fields of telecommunications and scientific research. The main objectives are to gather information to better understand the science of space weather, while verifying high-speed communications concepts through the use of advanced space technologies.

The Honourable James Moore, Minister of Industry and Minister responsible for the CSA, commented on this first launch under his tenure.

"This is a moment of pride for all Canadians. With the CASSIOPE mission, the Government reaffirms its commitment to support Canada's space industry while using space technologies to advance knowledge in areas of critical scientific inquiry," said Minister James Moore.

"The Canadian Space Agency is proud to contribute to the CASSIOPE mission," said newly appointed President of the CSA Walter Natynczyk. It enables the integration of the Government's research and development agenda while partnering with Canadian space industry and university science sectors".

MacDonald Dettwiler & Associates Ltd. (MDA) led a Canadian industrial team that included Magellan Aerospace of Winnipeg Manitoba, COM DEV International of Cambridge, Ontario and the University of Calgary, Alberta in the development of the CASSIOPE mission. The small satellite mission was enabled through contributions from the CSA and Industry Canada's Technology Partnerships Canada.

For more information on CASSIOPE, visit the [Website](#).

With the launch of the hybrid small satellite CASSIOPE, Canada is making a significant contribution to unraveling the mysteries of space weather. To accomplish this feat, the satellite uses a dedicated scientific payload ePOP (enhanced polar outflow probe), which observes the ionosphere.

In addition, two technological advancements are supported by the mission:

- A new Smallsat spacecraft Bus
- A communications technology demonstrator, Cascade

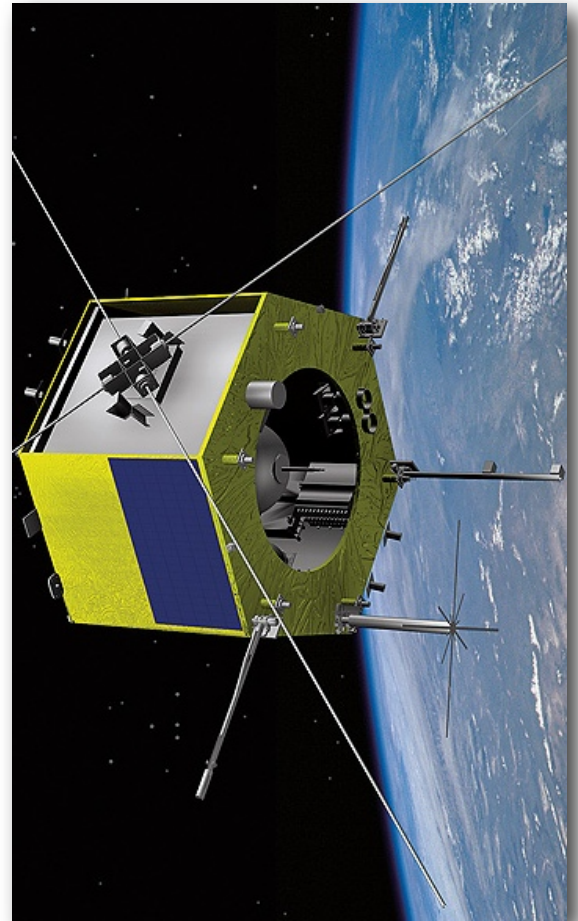
ePOP

The ePOP probe observes the Earth's ionosphere, where space meets the upper atmosphere; ePOP comprises a suite of eight scientific instruments, including plasma imagers, radio wave receivers, magnetometers and cameras. These are collecting data about the effects of solar storms and, more specifically, their harmful impact on radio communications, satellite navigation and other space and ground-based technologies.

Cascade

The communications technology demonstrator payload, entitled Cascade, serves as the second mission payload. Cascade is providing a 'proof of concept' design for a high volume store-and-forward data communications operational concept.

Like a courier in the sky, Cascade's operational concept is to pick up very large digital data files and deliver them to almost any destination in the world.



Small and versatile

CASSIOPE's hexagonal Smallsat bus platform measures only 180 cm long and 125 cm high.

It is more cost effective to construct and launch several small satellites with different goals than combining all the functionality on one big satellite. In addition to reducing the risk, this means that the satellites achieve their scientific or commercial objectives at a more reasonable cost.

The new platform produced for the CASSIOPE mission is also versatile: it is possible to adapt and use it for various missions involving science, technology, Earth observation, geologic exploration and information delivery.

Professor Andrew Yau of the [University of Calgary](#) directs the ePOP project and a [team](#) comprised of researchers and engineers from seven Canadian universities. The Communications Research Centre, located in Ottawa, as well as the Institute of Space and Astronautical Science of Japan and the U.S. Naval Research Laboratory are also partners in the project.

Moreover, CASSIOPE benefits from a solid partnership between the private and public sectors. Spearheaded by MacDonald, Dettwiler and Associates Ltd. (MDA), industry involvement has included Magellan and ComDEV. Vancouver's MDA serves as the mission prime contractor and is leading mission operations with the University of Calgary for a period of 18 months.

What is the nature of the dark universe?

Oct 3, 2013 Taken from the 25th anniversary issue of *Physics World*, this article examines one of the five biggest unanswered questions in physics as selected by the magazine's editors

Just over 95% of our universe comes in the shrouded form of dark energy and matter that we can neither explain nor directly detect. [Catherine Heymans](#) explores this enigma and describes where we will look next in our search for darkness



[What is the nature of the dark universe?](#)

This year the Planck space mission released exquisite observations of the early universe, providing the strongest evidence yet that the universe we live in is very dark indeed. Its precise results show that our universe is composed of 26.8% dark matter and 68.3% dark energy, while less than 5% is made up of the stuff we are familiar with on Earth. With their long-standing quest to make these precision measurements essentially now concluded, cosmologists are rapidly turning their attention to a much bigger and further-reaching question: what is the exact nature of this dark universe?

Dark matter is exactly what it says on the tin: it is dark and comprised of a mysterious substance that does not emit or absorb light. We only know it exists because of its gravitational effects on the normal matter that we can see. Dark energy is less well described by its label, being an invisible source of energy that drives the post-Big-Bang expansion of the universe to mysteriously accelerate. Together, these two dark entities play out a cosmic battle of epic proportions. While the gravity of dark matter slowly pulls structures in the universe together, dark energy fuels the universe's accelerating expansion, making it ever harder for those dark-matter structures to grow.

It is widely believed that to truly understand the dark universe, we will need to invoke some new physics that will forever change our cosmic view. As the conclusion of this dark quest could be so far reaching, astronomers are approaching the task with care, using a series of independent and meticulous observations. Efforts include the Canada–France–Hawaii Telescope Lensing Survey, which has directly mapped out the invisible cosmic web of dark matter by observing how its mass bends space and time, lensing the light of very distant galaxies. Projects such as the Sloan Digital Sky Survey are accurately charting the locations of billions of galaxies, which closely trace the distribution of dark matter because this gravitationally attractive substance dictates where and when galaxies form. Galaxies also carry with them a signal imprinted in the distribution of normal matter just after the Big Bang that can be seen in how galaxies cluster in the cosmos today.

Capturing dark matter

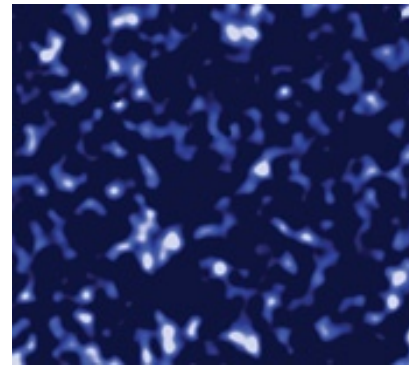
Astronomers have put their theories of dark matter to the test, finding that a very wide variety of observations all agree with a single theory, termed the "concordant cosmology". This overwhelming body of evidence supports the theory that dark matter is made up of weakly interacting matter particles (WIMPs), and the challenge is now on for particle physicists to go out and catch or create one.

Several attempts have already been made to trap a dark-matter particle, but any hints of success have so far been controversial and open to interpretation. The next major leap in the search for a fleeting

glimpse of a dark-matter particle in flight is taking shape not in space but nearly 1.5 km under the Black Hills of South Dakota. The LUX-ZEPLIN experiment will use ninetonnnes of liquid xenon as its dark butterfly net. The hope is that a few of the trillions of WIMPs that pass through the Earth every second will be caught crashing into some of the xenon particles. How successful this new experiment will be in its quest to uncover the nature of dark matter will depend on just how much of a wimp the dark-matter particle turns out to be. An unquestionable direct detection of a dark-matter particle would be one of the most significant discoveries of this century, finally confirming Fritz Zwicky's theory, which was ridiculed when he proposed it in 1933.

Exposing dark energy

While the astronomical community is now fairly united in postulating the existence of an invisible dark-matter particle, the same cannot be said about its support for the simplest explanation for dark energy. Observations that the expansion of our universe is accelerating are most easily explained by considering the extra energy associated with the vacuum that permeates the universe. According to quantum theory, empty space is filled with a swarm of virtual particles with a wide range of masses that can briefly pop in and out of existence. As mass and energy are equivalent, the growing vacuum within an expanding universe acts like a bank of unlimited energy, inflating the whole universe at an accelerated speed.



[Dark cosmic web](#)

Unfortunately, there is a problem with this simple and elegant vacuum solution to the nature of dark energy. Particle physicists can make a theoretical estimate for the energy of a vacuum and they find that it is 120 orders of magnitude larger than the dark energy that the Planck results show.

This wild discrepancy has

opened up a wide range of exciting new dark-energy theories including exotic models such as a multiverse that resembles the middle of an Aero chocolate bar. Perhaps our universe is one Aero bubble being pulled by our neighbouring Aero-bubble universe?

Many cosmologists believe that the dark-energy phenomenon indicates that we need to look beyond Einstein's theory of general relativity. By observing how dark-matter structures change over cosmic time, we can investigate how dark energy evolves and test gravity for the first time on cosmological scales. Just as Einstein revolutionized our understanding of Newtonian gravity, confirmed through observations of the solar system, so new observations of gravity on cosmological scales may bring about another revolution in our understanding of gravity.

Two major new international projects will lead our quest to discover what the dark-matter particle is and why the expansion of our universe is apparently accelerating. The Euclid satellite, due to launch in 2020, will image the full dark sky from above the Earth, while the Large Synoptic Survey Telescope, due to see first light in 2019, will image the full Southern sky from a mountain top in Chile. Both of these projects will chart the distant universe with exquisite precision, utilizing a diverse range of cosmological tools to map out the evolution of dark-matter structures and document the expansion and curvature of space and time from 10 billion years ago to the present day. Exciting times are ahead for our understanding of the fundamental physics that govern the dark side of the universe.

About the author

[Catherine Heymans](#) is a reader in astrophysics at the University of Edinburgh, UK, and a member of the Young Academy of Scotland

Comet ISON (C/2012 S1) ... Just Passing Through

"We are all visitors to this time, this place.

We are just passing through.

Our purpose here is to observe, to learn, to grow, to love ...

And then we return home ..."

Aboriginal philosophy recounted by Julian Barbour

"The End of Time"

It was Tuesday evening, around 7:00 PM on October 8th, 2013, and Paula and I had stepped outside our cottage for a walk over to our rental cabin, also located at Little Pine Tree Harbor. As our eyes dark-adapted, we both exclaimed at the same time, "Northern Lights"! The auroral activity hugged the Northern horizon from Ursa Major to Perseus. The display became more animated as we watched, and for the next 30 minutes, it produced spikes, rays, and shallow undulating curtains that reached upwards to 60 degrees. This was the best Northern Lights display we had seen in a few months. Sometimes, evening walks can turn into wonderful poetic experiences. I took this auroral display to be a good omen. Tomorrow morning I had a date with Comet ISON. I had checked the "Clear Sky Clock" and for the morning of October 9th, when Comet ISON was predicted to be beside Mars, the sky looked promising. Clear Fall nights don't come very often and I wasn't going to miss this opportunity. I set the alarm for 3:30 AM.

Comet ISON is named after Russia's International Scientific and Optical Network. The discovery photograph of ISON was taken at the Kislovodsk Observatory station about a half hour before morning twilight on September 21st, 2012. Vitali Nevski and Artyom Novichonok noticed the comet on images taken with the observatory's 16 inch Santel reflector. The comet was a fuzzy, 19th magnitude object located between Gemini and Cancer. The orbital elements indicated this comet was a first-time visitor from the Oort cloud. ISON has the official designation as C/2012 S1; [see <https://www.iau.org/public/themes/naming/#comets> for a description of the IAU comet naming system.-ed]

But, ISON seemed special. It was well beyond the orbit of Jupiter (6 AU) when it was discovered and appeared brighter than it should be for that distance. When ISON's orbital elements were calculated it was learned that at perihelion (closest approach to the Sun) Comet ISON would pass just 1.16 million km above the surface of the Sun a veritable sun-grazer! By travelling less than one solar diameter above the sun's surface, Comet ISON would be moving through the energetic solar corona and also be subjected to our Sun's intense heating effects, solar storms, and tidal distortions. Astronomers predicted that ISON's nucleus could either fragment or completely disintegrate under this barrage. Some early predictions said the comet's head could appear as large, and as bright, as the Full Moon. It could even sport a dust tail that might stretch halfway across the sky after it rounded the sun! ISON could become the "comet of our dreams"; indeed, the Comet of the Century! Images of Ikeya-Seki (C/1965 S1), Hale-Bopp (C/1995 O1), Comet McNaught (C/2006 P1) and the Great Comet of 1680 (C/1680 V1) filled my mind! It's no wonder that the marketing hype began. In the recent issue of Sky News, for example, Celestron, has placed an advertisement entitled, "ISON is Coming – Get on Comet Watch". Celestron is not alone in their attempt to use ISON as a marketing tool.

Comet PANSTARRS (C/2011 L4), which last year didn't live up to the hype, should serve as a cautionary flag. During my mountain hikes in Arizona last winter, I stopped counting the number of times that I was asked where to look, after sunset, for the magnificent comet everyone had heard about. It was difficult to explain to people unfamiliar with the sky. At our Arizona Sky Village hacienda we had the advantage of transparent, cloud free evening skies and even then, to see Comet PANSTARRS, we still had to use binoculars and know where to look.

I have been an amateur astronomer for almost 45 years and have been disappointed before by predictions of specific "best and brightest" astronomical events. Comet Kohoutek (C/1973 E1) is a case in point because it partially disintegrated at perihelion and became an "underwhelming" apparition. After Comet Kohoutek's failure to live up to its advance billing the astronomical community became very conservative in their comet predictions. Then, in 1975, along came another visitor from the Oort cloud, the spectacular Comet West (C/1975 V1). Its nucleus split into 4 pieces as it rounded the sun and the comet brightened by 4 magnitudes... this time without the advance billing that Kohoutek received. Too bad, because Comet West was the second most



See Doug's Comet ISON image on pg 7.

spectacular comet this writer has ever witnessed after Hale-Bopp (C/1995 O1). I think we have learned a lesson from these experiences of various comet booms and busts and now, when informing the public, we qualify our predictions and downplay the sensationalism.

My alarm clock went off at 3:30 AM and I went out onto our back deck to see if the clear skies that had accompanied me to bed were still present. The morning sky was simply grand and bright winter constellations, prominent Milky Way star clusters, and morning planets decorated the overhead stage. I dressed warmly and finished my coffee and morning cereal. As I walked the curved path to the front door of our "Four Elements Observatory" I noticed that, although Mars had risen, it was still low in the East, and Jupiter, in Gemini, was simply dazzling. But my destination this morning was Comet ISON and Mars would be my signpost for finding it. Although they would appear to be within a few degrees of each other on the celestial sphere, Comet ISON was predicted to be 10 magnitudes fainter than Mars ... that's almost 9,500 times fainter! Detailed star charts would prove essential in placing ISON in my camera's field of view.

I had placed both my TAK FSQ 106 and TAK TOA 150 piggy-back on the TAK EM 400 equatorial mount. My plan was to use the FSQ 106 to find ISON and then image ISON with a Canon 60Da attached to the TOA 150. I checked out the FOV in the vicinity of Mars and carefully noted the star patterns. No comet was visible at first and I thought "this comet is really faint". I relaxed and as my eyes adapted, I thought I glimpsed a faint background nebulosity to one side and moved the telescope assembly to that location. I took a test image of about 30 seconds at 4000 ISO and, like a ghostly apparition, ISON materialized right there on the camera's LCD viewing screen. Comet ISON had a small tail, a slightly bulbous coma, and sported a tiny nucleus. I then took a series of 2 minute exposures at 4000 ISO. Because I had activated the Canon's noise reduction software (both High ISO and Long Exposure noise reductions) each image interval took about 6 minutes. After each 6 minute interval, I could easily detect ISON's motion against the background stars.

Later that morning I cropped, stacked, and processed the ISON images using Maxim DL and iPhoto software. Later the next day I compared one of my images of ISON with the magnitude and position predictions of both the Minor Planet Electronic Circulars and those of my planetarium program, Sky Safari. On my October 9th image, ISON was on track both in predicted brightness (10.3) and in position. This pleased me because it provided an early indication that ISON would be, if not a spectacular comet, at least an interesting one. I know that first time comet visitors from the Oort Cloud are notoriously unpredictable, especially for those that become "Sun Grazers".

Although these MPEC predictions don't forewarn of a "best in our lifetime comet" they do indicate that, if ISON survives its close approach to the Sun, it could produce a pleasing naked eye and binocular cometary apparition during the last two weeks of November and the first 3 weeks of December. Maybe there is a Santa Claus and our Christmas present for this year, after ISON passes perihelion, will be a wonderful comet, wrapped in the subliming ices of a fragmented nucleus, accompanied by a spectacular flowing dust tail, and attended by a blue, gaseous, ion tail. Now, that would be an early Christmas present!

Comet ISON Now in View

Comet ISON is now an observable object in the morning sky. Two BAS members have photographed it (Aaron T. and Doug C. -image right). Universe Today article by David Dickinson <http://www.universetoday.com/104818/comet-ison-a-viewing-guide-from-now-to-perihelion/> gives more details about how to view ISON. Here are the key dates and observing hints. Please send in your observing reports to SGN for the Dec issue. -ed

Below: Comet ISON, 5:30AM EST, October 9th, 2013 Doug Cunningham Image taken from Four Elements Observatory Canon 60Da attached to a TAK TOA 150 4000 ISO, 4x2 minute stack



-Early November: Comet ISON may make its naked eye debut for observers based at dark sky sites.

-November 3rd: A hybrid (annular-total) [solar eclipse](#) occurs, spanning the Atlantic and Central Africa. It may just be possible for well placed observers to catch sight of ISON in the daytime during totality, depending on how quickly it brightens up. The Moon reaching New phase also means that the next two weeks will be prime view time for ISON at dawn.

-November 5th: ISON crosses the border from the astronomical constellation of Leo into Virgo.

-November 7th: ISON passes less than a degree from the +3.6 magnitude star Zavijava (Beta Virginis).

-November 8th: ISON passes through the equinoctial point in Virgo around 16:00 EDT/ 20:00 UT, passing into the southern celestial hemisphere and south of the ecliptic.

-November 14th: ISON passes less than a degree from the 10th magnitude galaxy NGC 4697.

-November 17th: The Moon reaches Full, passing into the morning sky.

-November 18th: ISON passes just 0.38 degrees north of the bright star Spica.

-November 22nd: ISON crosses into the astronomical constellation of Libra.

-November 23rd: ISON sits 4.7 degrees SSW of the planet Mercury and 4.9 SSW of Saturn, respectively.

November 25th: ISON pays a visit to another famous comet, passing just 1.2 degrees south of short period comet 2P/Encke which may shine at +8th magnitude.

-November 27th: ISON enters the field of view of [SOHO's LASCO C3](#) coronagraph.

-November 28th: ISON reaches perihelion at ~18:00 PM EST/ 23:00 UT.

After that, all bets are off. The days leading up to perihelion will be tense ones, as ISON then rounds the Sun on a date with astronomical destiny. Will it join the ranks of the [great comets of the past](#)? Will it stay intact, or shatter in a spectacular fashion? Watch this space for ISON updates... we'll be back in late November with our post-perihelion guide!

Be sure to also enjoy recently discovered [Comet C/2013 R1 Lovejoy](#) later the year.

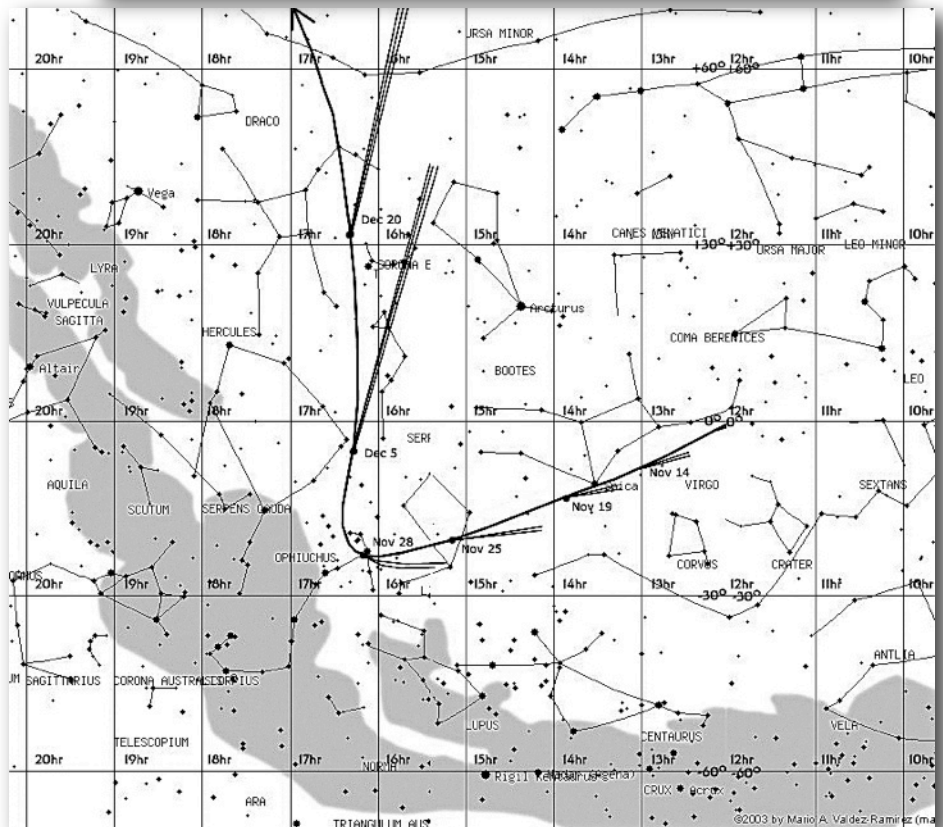


Chart above shows path in the sky of Comet ISON before and after its perihelion. The comet is an early morning object during its entire apparition.

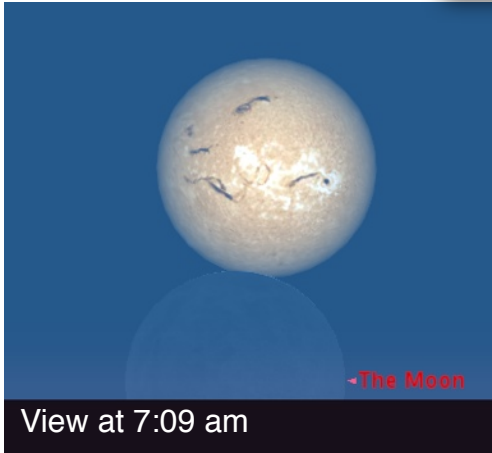
Read more: <http://www.universetoday.com/104818/comet-ison-a-viewing-guide-from-now-to-perihelion/#ixzz2hZFzxIKO>



Sun clears horizon (OS) just after 7:07 am -The Moon



View at 7:08 am -The Moon



View at 7:09 am -The Moon



Moon leaves sun's disk at 7:10 am -The Moon



This month's solar eclipse is neither annular or total but both, depending on where you are located along the path of totality. A **hybrid** solar eclipse refers to a solar eclipse where some sections of the central eclipse path are annular and other parts are total. If you were at just the right spot in the Atlantic Ocean, you'd possibly see a four-second annular eclipse at sunrise. According to Jean Meeus and Fred Espenak, the eclipse changes from annular to total in just fifteen seconds, and the remainder of the approximate 13,600-kilometer central eclipse track remains total. The International Astronomical Union and the US Naval Observatory – using slightly different parameters – call it a total solar eclipse. Technically speaking, by Meeus and Espenak's calculations, the 2013 November 3 is a hybrid (annular/total) solar eclipse. However, the eclipse changes from annular to total almost immediately after the start of the central eclipse, and moreover, the moon comes progressively closer to Earth throughout the duration of this eclipse. [This description from <http://earthsky.org> -ed]

Three minute eclipse for Owen Sound

If you are not planning to travel to Africa, the view from Grey-Bruce will be disappointing. The eclipse is partial of course, starts around 5:22 am EST and is at maximum around 6:16 am EST. At this point more than half the sun's diameter is covered by moon. Unfortunately, the sun has not risen in our sky yet! By the time the bottom edge of the sun clears the horizon, around 7:07 am, the eclipse has only 3 minutes left. By 7:10 am EST with the sun a mere 45 minutes of arc (0.75 °) above the horizon, the moon departs the sun's disk. The Stary Night rendition left shows the stages and assumes we have perfectly clear sky at the horizon and a flat ocean level view. Knock off some time if these conditions are not met.

The best place in Canada to view this eclipse is the eastern end of Nfld where the sun is about 9° high and about 40% of the sun's diameter is obscured by the moon. This eclipse occurs mostly over water and the only part that is over land passes over Gabon, Congo, Uganda, Kenya, Somalia and Ethiopia. The eclipse track ends on land over Somalia before it gets out into the Indian Ocean.

Divers pull huge 'Chelyabinsk meteor[ite] chunk' from lake

Oct 16, 2013 by Dmitry Zaks From phys.org/

Russian divers Wednesday pulled from a murky lake in the Urals a half-tonne suspected meteorite said to have been part of a meteor whose ground-shaking shockwave hurt 1,200 people in February.

The dramatic recovery operation came eight months after a piercing streak of light lit up the morning sky in the central Russian region of Chelyabinsk in scenes some locals said made them think of the onset of a nuclear war.

The meteor broke up into myriad pieces—some no bigger than the size of a fingernail—that scientists are still finding across the remote region to this day. Much of the debris landed in a local lake called Chebarkul that the divers entered on Wednesday in an operation covered live on national television.

Broadcasts showed a team pull out a 1.5-metre-long (five-foot-long) rock from the lake after first wrapping it in a special casing while it was still underwater. The boulder was then pulled ashore and placed on top of a massive scale for the all-important weighing—an operation that quickly went partially wrong. The rock crumbled into several chunks as scientists began lifting it from the ground with the help of levers and ropes.

The scale itself broke the moment it hit the 570-kilogram (1,255-pound) mark. "The rock had a fracture when we found it," one unnamed scientist told the lifenews.ru website in a live broadcast.

"It weighed 570 kilograms before the pieces fell off. And then the scale broke," said the scientist. "We think the whole thing weighs more than 600 kilograms," he said.

Experts warned it will take time before scientists can certify that the rock they pulled from the lake did indeed come from outer space.

The Vesti 24 rolling news channel reported that divers had already recovered more than 12 pieces from Lake Chebarkul since the February 15 incident. Only four or five of the pieces turned out to be real meteorites, the channel said. But researchers at a local university seemed confident in their latest find.

"Based on our initial observations... this is a part of the Chelyabinsk meteor," Sergei Zamozdra, a lecturer at Chelyabinsk State University, told the Interfax news agency. "This is the largest fragment of that meteor," said the scientist. "And most likely, it will be one of the 10 largest meteorites ever found."

The meteor weighed a whopping 10,000 tonnes when it exploded a few kilometres up in the air with the force equivalent to 30 of the nuclear bombs dropped on the Japanese city of Hiroshima during World War II.

US scientists said an object that large usually approaches Earth only once every four decades.



Residents of Chelyabinsk—once a part of the Soviet Union's industrial heartland that has seen a dramatic slide in living standards of late—have been trying to use the meteor as a way to draw tourists to their isolated part of Russia.

A special council made up of scientists and prominent residents this week urged the local government to erect a six-storey-tall statue in honour of the space rock. Chelyabinsk media reports said the council is also hoping to set up special hiking trails for foreign tourists interested in visiting the lake and other spots where debris was found.

Below: Crater blasted in ice-covered Lake Chebarkul on Feb 15, 2013 probably by the fragment above.



Triangulum (Tri) α-Trianguli - Rasalmothallah

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

DOUBLE STARS

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

MESSIER OBJECTS

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

Other Objects of Interest (Sag)

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

Aries (Ari) γ Arietis - Mesarthim

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

DOUBLE STARS

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

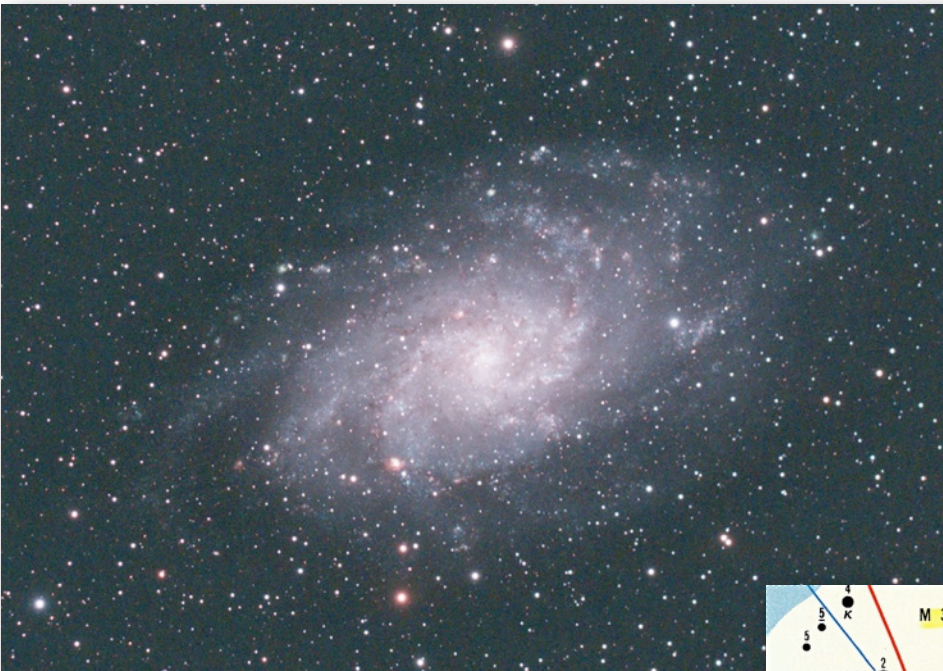


Image of M33 by Frank Williams Taken from Allenford over 3 nights Oct 2, 8, 9, 2013 Total of 133 images 180 seconds each approx 6 1/2 hours, through an 85 mm Televue APO scope Camera Canon T2i DSLR with a CCD-CLS filter. Stacked in Pix-insight software.

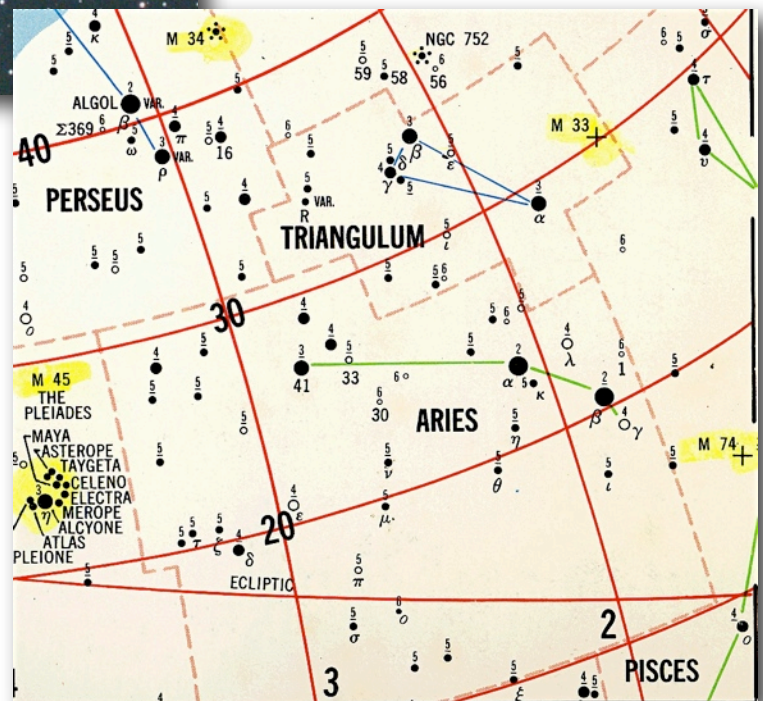
M33, the Triangulum Galaxy, is a perennial favorite of amateur and professional astronomers alike, due to its orientation and relative proximity to us. It is the second nearest spiral galaxy to our Milky Way (after M31, the Andromeda Galaxy) and a prominent member of the "local group" of galaxies. From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

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

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

Chart Legend

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



- Nov 1 Venus greatest elongation E (47°)
- Nov 2 Spica 0.8° S of Moon
- Nov 3 Daylight Saving Time ends (2 am Sunday)**
New Moon rises locally at 7:07 am EST
Hybrid Solar Eclipse (see pg 7)
- Nov 6 Moon at perigee (365 361 km)
Venus 8° S of Moon
- Nov 10 First Quarter Moon** rises at 12:59 pm EST
- Nov 17 Full Moon** rises at 4:34 pm EST
Leonid Meteors peak 20/h (Note: FM night!)
Mercury greatest elongation from sun (19° W)
- Nov 22 Jupiter 5° N of Moon
Moon at apogee (405 443 km)
- Nov 25 Last Quarter Moon** rises at 11:51 am EST
Mercury 0.3° S of Saturn (ISON nearby, 6 am look east)
- Nov 29 Spica 0.9° S of Moon; occultation not visible in Bruce-Grey
- Nov 27 Mars 6° N of Moon

Planets

MERCURY, re-appears in the dawn sky in the second half of November and is favourably placed near Saturn and Comet ISON.

VENUS, (-4.8 by month end), is the bright Evening Star low above the western horizon all month. The crescent moon is nearby on Nov 6. It is inside the lid of the Teapot from Nov 11 to 15. **MARS** (1.4) is a dawn planet mostly in Leo rising about 2 am EST. It is moving fairly quickly eastwards and passes into Virgo by the 25th. **JUPITER**, (-2.5) is rising 3 hours before midnight in early Nov and around 7:30 pm by month end. Observing season for the Planet King has started. **SATURN**, (mag 0.5) leaves the Sun's vicinity by month end and appears near Mercury on the 25th. Both **URANUS**, (5.7) and **NEPTUNE**, (7.8) are above the horizon by 7 pm in Nov. They set in the West just after midnight. Both the **asteroid, Vesta (7.4)** and **dwarf planet, Ceres (7.9)** are in the same part of the dawn sky as Mars. Charts are available on the BAS website. **PLUTO** (mag. 14) is in twilight sky presently and not well-placed for viewing in Nov.

The diagram below gives the sunrise/sunset times and the Sun's altitude on three dates this month. The sun is now well past equinox and approaching the Winter Solstice next month.

The November 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.

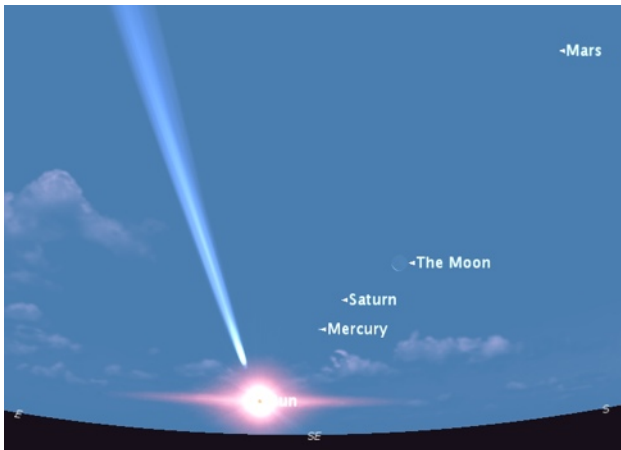
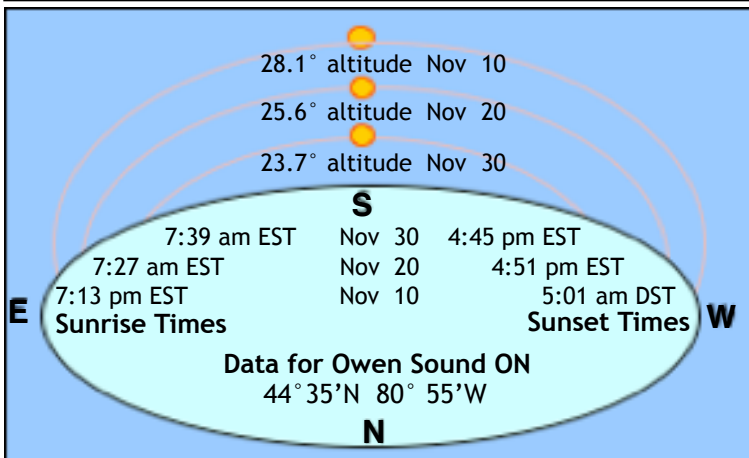
BAS Events

- Nov 2 (NM-1) BAS viewing @Fox** ES Fox@dark, backup night Nov 29 (LQ+4)
- Nov 6 Wed BAS meeting** Grey Roots Museum 7 pm
Member's Night presentations
- Nov 10 (FQ) Comet ISON** should be visible in the morning sky (near Mars and Spica) from now on and passes Spica Nov 17/18. Starry Night gives Nov 10 as the time when the comet reaches 5th magnitude. It will decline to 5th magnitude again around Jan 4. Two months of Comet viewing! However, the bright moon will brighten the sky Nov 15 to 23 or so. Then it becomes a crescent while the comet swings around the sun Nov 28. Once the comet starts its outward journey, the moon does not interfere until after Dec 15 or so as it rises as a waxing gibbous moon at comet viewing time.

Special Events

Comet ISON at dawn

The last week before Comet ISON reaches perihelion (Nov 28) may be the best time to see a comet, two planets, (Saturn and Mercury) and the thin crescent moon all together in the same part of the sky. Early Nov is also good since the moon is not in the dawn sky near the comet, but there is a short time of 3 or 4 days just before Nov 28 when the tail will hopefully be large and the comet bright before it makes its hairpin turn around the Sun. Start looking for clear dawn sky Nov 21 or so and watch Saturn and Mercury slide past each other (less than half a degree on Nov 25). The Moon comes into the picture as a crescent from Nov 27 to Dec 2 (when it is new), spanning the dates of ISON's quick sweep around the Sun. ISON is best seen in the morning sky before perihelion and after then is visible in BOTH am and pm skies. Later in December it becomes circumpolar and can be seen all night long. Unfortunately, it is fading after perihelion and may even have been adversely affected by its close pass to the Sun. Check page 8 above for more details about viewing opportunities.



Comet ISON in relation to the Sun on Nov 30 at 9 am. Sunrise is just 20 minutes earlier. This may be the first opportunity to spot ISON after perihelion and if it has survived the trip around the sun. Keep your fingers crossed.

Nov 2013

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

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 Dobbs 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

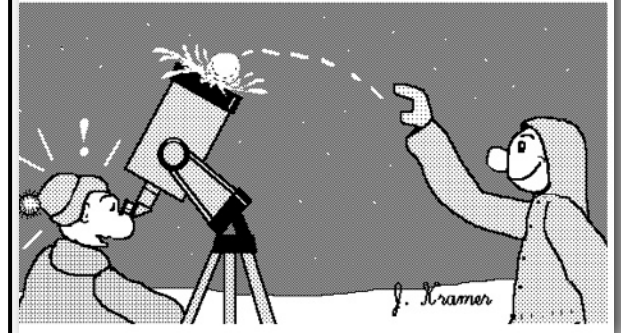
(Now also on our website)

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



Henry was sure he had visually confirmed that comets are really just dirty snowballs...



Comet C/2012 X1 (Linear) Explodes!

OCT 20/13: COMET LINEAR X1: The sun isn't the only thing exploding. Almost 450 million km from Earth, Comet C/2012 X1 (LINEAR) is having its own outburst. On Oct. 20th, amateur astronomers realized that the comet's brightness had increased 100-fold and its morphology resembled that of exploding Comet 17P/Holmes in 2007. Follow-up images in recent nights seem to show jet-like structures in Comet LINEAR X1's expanding atmosphere. Amateur astronomer Nick James of Chelmsford, UK, obtained the above images on Oct. 26th.

Another set of images taken by James shows the comet's atmosphere or "coma" expanding over a period of two days. "The coma's diameter is increasing at a rate of 30 arcseconds per day," says James. "At a distance of 2.95 AU this corresponds to 65,000

km/day or a little less than 1 km/s." He made these observations using an 11-inch Celestron telescope.

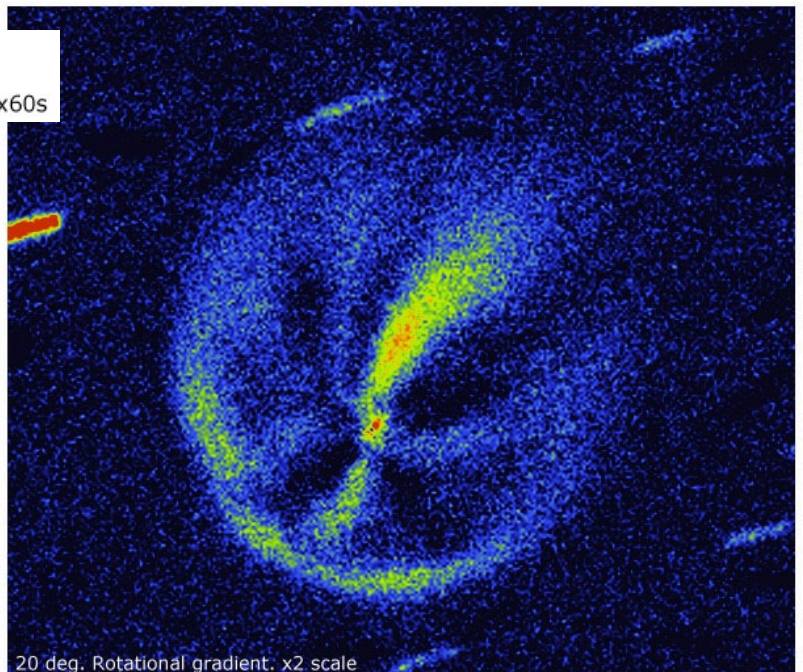
Located in the constellation Coma Berenices, Comet LINEAR X1 rises in the east about an hour before the sun. The low altitude of the comet in morning twilight is a challenge, but because the comet is fairly bright, magnitude +8.5, it is still a relatively easy target for backyard telescopes equipped with digital cameras. Monitoring is encouraged!

[This item obtained from Spaceweather.com which will undoubtedly have more updates. -ed]

C/2012 X1 (LINEAR) in outburst. Unfiltered ST9XE + C11. FOV 13'x13', N up. Nick James. Mid time: 2013-10-26 05:00:55, Span: 1677s, Exposure: 26x60s



Raw frame, Log stretch



20 deg. Rotational gradient. x2 scale