Star Gazer News

INTERNATIONAL YEAR OF LIGHT 2015

Astronomy News for Bluewater Stargazers
Vol 9 No. 6 June 2015

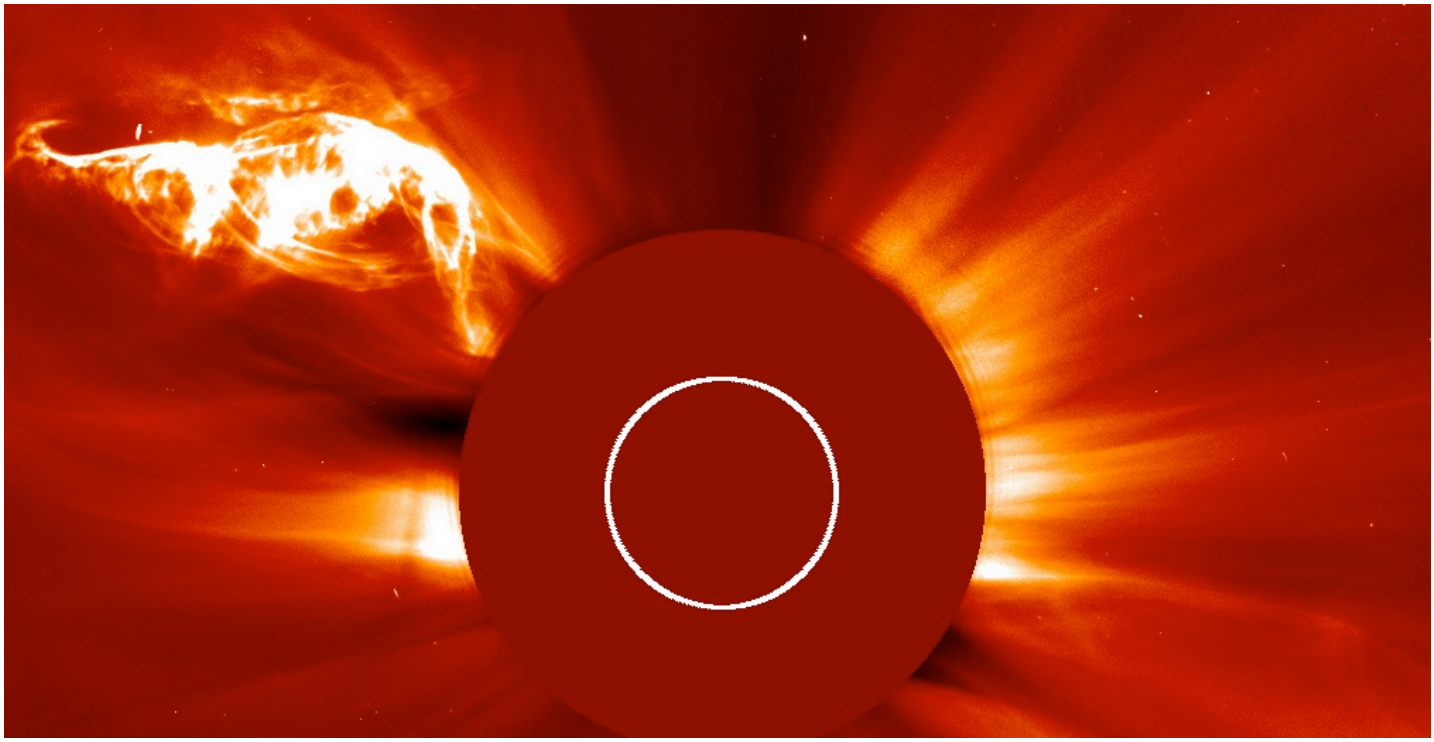
Perimeter Institute in Waterloo, ON, has issued a series of posters honouring Women in Physics. SGN 2015 issues will feature women who have made major contributions to astronomy and physics.

June 2015 Contents

Enormous "Plasma Snake" Erupts from the Sun

By Jason Major Universe Today: Over the course of April 28–29 a gigantic filament, briefly suspended above the surface of the Sun, broke off and created an enormous snakelike eruption of plasma that extended millions of miles out into space. The event was both powerful and beautiful, another demonstration of the incredible energy and activity of our home star…and it was all captured on camera by two of our finest Sun-watching spacecraft.

Made from data acquired by both NASA's Solar Dynamics Observatory (SDO) and the joint ESA/NASA SOHO spacecraft, the video was compiled by astronomer Karl Battams. It shows views of the huge filament before and after detaching from the Sun, [video here: https://www.youtube.com/watch?v=yt_nq9F4dyo] and gives a sense of the enormous scale of the event. At one point the plasma



eruption spanned a distance over 33 times farther than the Moon is from Earth! Filaments are long channels of solar material contained by magnetic fields that have risen up from within the Sun. They are relatively cooler than the visible face of the Sun behind them so they appear dark when silhouetted against it; when seen rising from the Sun's limb they look bright and are called prominences. When the magnetic field lines break apart, much of the material contained within the filaments gets flung out into space (a CME) while some gets pulled back down into the Sun. These events are fairly common but that doesn't make them any less spectacular!

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From the Editor: A Good Spring for Imaging

BAS astrophotographers have been very busy in the last month or so. The scale up in activity was not unexpected. Spring has brought clear skies and the nighttime temperature is no longer in the -20 C range as it was this past winter. How cold was it? Cold enough to shrink the metal and wood structure of the ES Fox roof to the point where it would not open without blowing a fuse or two. I suppose cranking the roof shut manually was one way to keep warm!

Since the late winter/early spring is the best time for the galaxies in Ursa Major (M81, M82 and M51) and the Realm of Galaxies is highest, it is not a surprise to get some galaxy images from our contributors Frank W. and Paul Z. See the Astrophotography Page (10) for those. A detailed Virgo Cluster map is on pg 13. And check out the spectacular image of M81 compliments of Frank W. on the home page of our website as well.

Much easier to photograph are planets and the Moon of course, and in our western sky this spring both Venus and Mercury slid past the Pleiades. Although the separation was not as close as some in the past, the close proximity of the brightest planet and the nicest open cluster in our sky is always a photo opportunity. Furthermore, skies were clear for both planets' nearest approach to the Pleiades -imagine that!

The brightness of Venus is overwhelming in this image compared to Mercury at right. Image above was taken Apr 11 at about 9:21 pm DST with Venus considerably higher in elevation (12°) and in darker skies than the Mercury shot at right (3° elevation) taken May 1. The 2 minute exposure brought out many of the faint 9th and 10th magnitude background stars. Stars of 5th magnitude are the limit for the Mercury shot and the sky was never a nice black. Equivalent exposures for each would have totally overexposed the Mercury image. The Venus spikes are a camera artifact due to the small shutter opening, f/6.3.

BAS Events for June and July

Jun 3 Wed **BAS regular Wed. meeting at ES Fox** Observatory. Stuart Heggie: Astrophotography
Jun 12 Fri **Summer Stargazing public viewing** #1 Planets, clusters and galaxies, starts at dusk
Jun 13 Sat **BEF Open House** (1 pm - 4 pm) at BOEC
Jun 13 Sat **BAS viewing@Fox** member observing night
Jun 21 Sun **Keppel Henge Summer Solstice Celebration**: Welcome the summer season at an awesome and robust solar observatory.
Jun 27/28 Sat/Sun **AstroCATS** astronomy fair/show Ontario Science Centre

JULY (July BAS Wed. meeting is **July 8, not July 1**)

Jul 8 Wed **BAS regular Wed. meeting at ES Fox** Observatory Topic: KW Webinar on Eyepieces -a live event.
Jul 10 Fri **Summer Stargazing public viewing** #2 Planets, clusters, galaxies in summer sky. Starts at dusk
Jul 11 Sat **BAS viewing@Fox** member observing night
Jul 17-19 BPNP Dark Sky Weekend (tentative dates) TBA
Jul 24 Fri Grey Roots Public viewing #1: Moon, planets, clusters and galaxies.Event starts at dusk.
Jul 25 Sat Webster visits Whispering Pines

Note: **Astronomy** Events for JUNE are listed on pg. 14.

Both images are displayed at about the same scale and both planets were about the same distance from M45, i.e. about 2 ° or so. Left image was 120 s long, focal length 100 mm f/6.3, ISO 3200. Mercury image above was a 6 s shot, focal length 285 mm, f/9, ISO 2000, taken May 1 at 9:51 pm DST. Longer exposures washed out everything -the sky was still too sunlit. Both images by John H. Canon 60Da, 100-400 mm zoom.

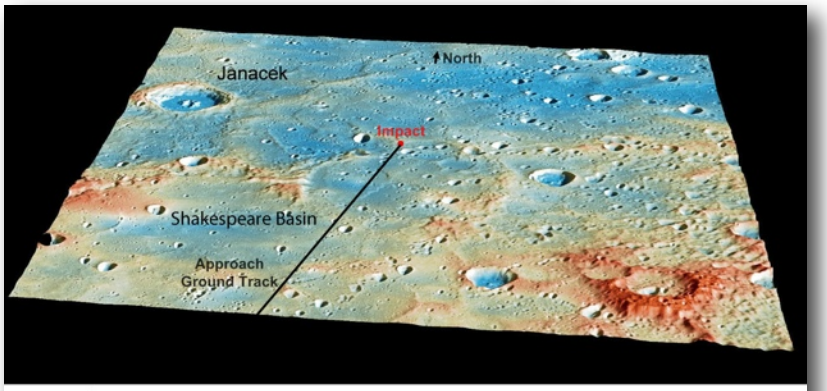
Mercury Probe Crashes onto Surface (on Purpose)

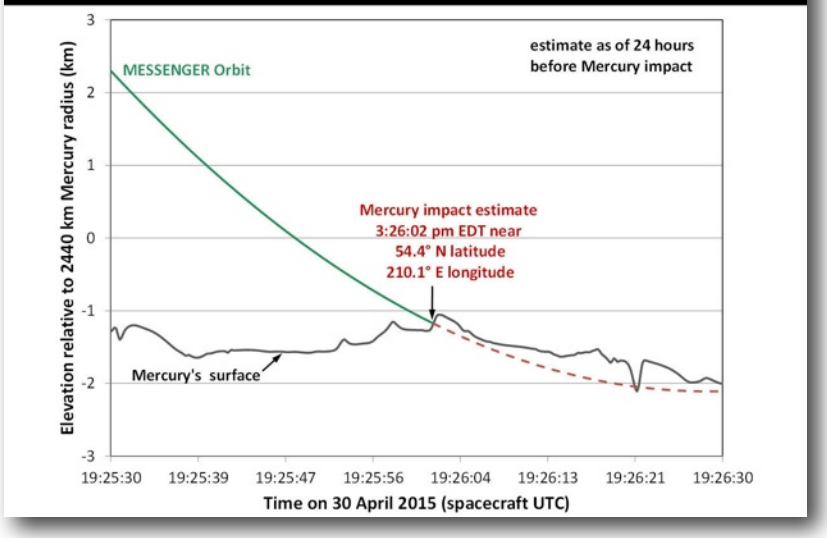
The planet Mercury has a brand new 52-foot-wide crater. At 3:26 p.m. EDT April 30, NASA's **MESSENGER spacecraft** bit the Mercurial dust, crashing into the planet's surface at over 13 900 km/h just north of the Shakespeare Basin. Because the impact happened out of sight and communication with the Earth, the MESSENGER team had to wait about 30 minutes after the predicted impact to announce the mission's end.

Even as MESSENGER faced its demise, it continued to take pictures and gather data right up until impact. To learn more about the mission's "greatest hits", check out its **Top Ten discoveries** or pay a visit to the **Gallery**.

MESSENGER mission controllers conducted the last of six planned maneuvers on April 24 to raise the spacecraft's minimum altitude sufficiently to extend orbital operations and further delay the probe's inevitable impact onto Mercury's surface. They even re-purposed a stock of helium, originally carried to pressurize the fuel, for a few final blasts to keep it alive and do science right up to the last minute. During its final hours today, MESSENGER will be shooting and sending back as many new pictures as possible.

Ground-based telescopes won't be able to spy MESSENGER's impact crater because of its small size, but the **BepiColombo Mercury probe**, due to launch in 2017 and arrive in orbit at Mercury in 2024, should be able to get a glimpse. [From universetoday.com]



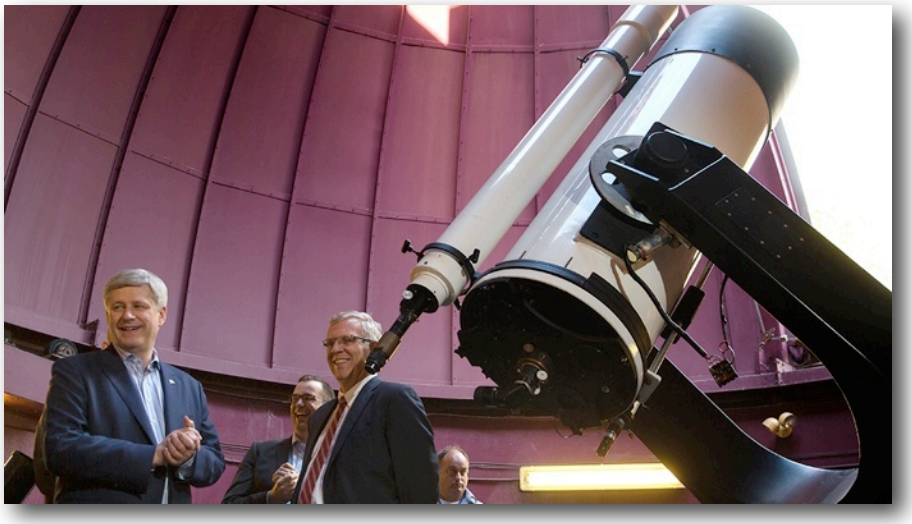


Canada Announces Support for 30 m Telescope

Vancouver, BC, 6 April 2015, Federal Gov't Release

Prime Minister Stephen Harper today announced the Government of Canada's intention to provide significant support for the Thirty Meter Telescope (TMT), an international project that will build one of the world's largest and most advanced astronomical observatories in Hawaii. The Prime Minister made the announcement following a tour of Vancouver's Gordon MacMillan Southam Observatory. He was joined by James Moore, Minister of Industry.

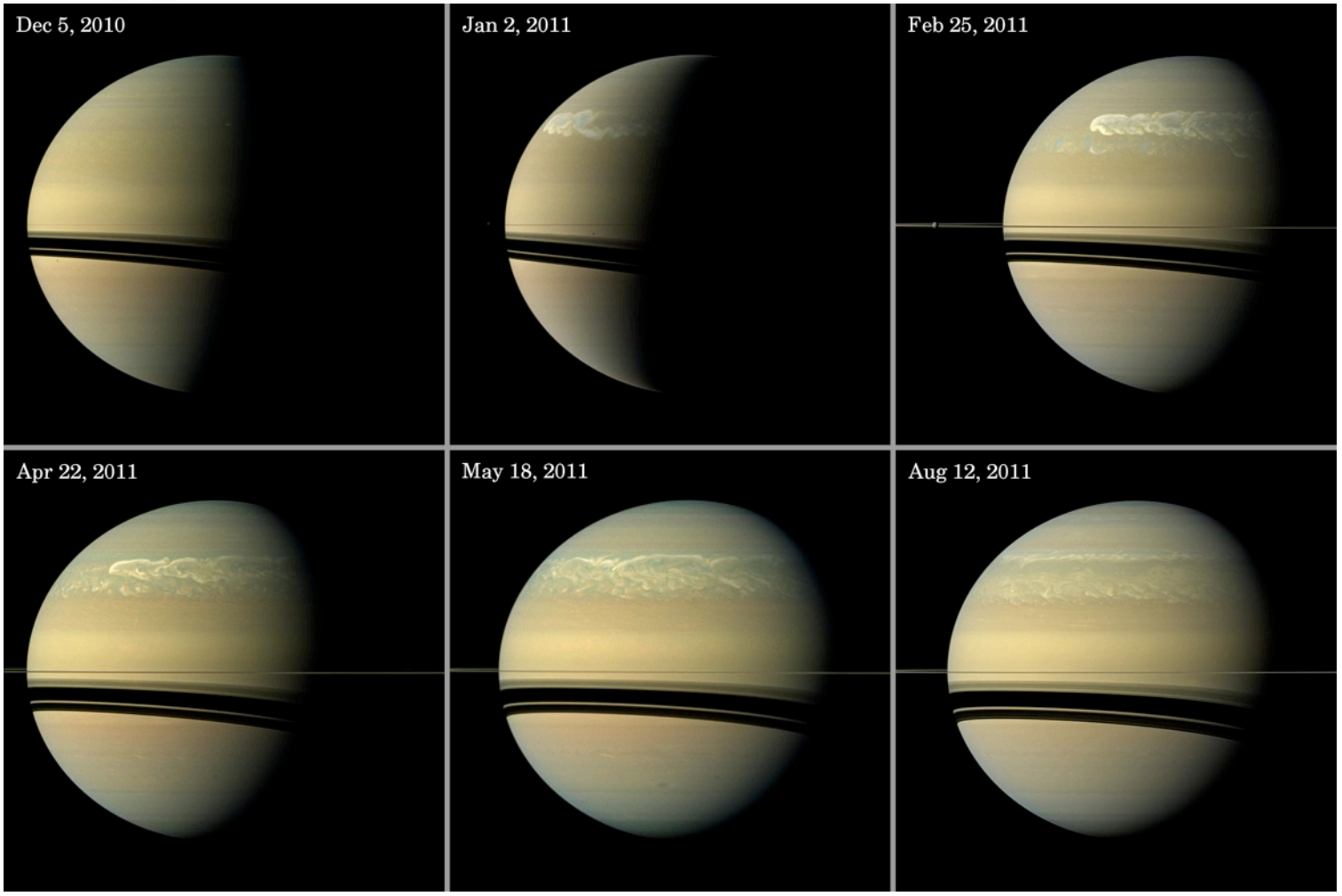
The Government's support would provide resources over 10 years to enable Canada's participation in the construction and commissioning of the TMT, alongside participants from the Japan, China, India and the United States.



The majority of the Government's support for the TMT will be spent in Canada, creating high-quality jobs related to the construction and assembly of key telescope components, including a precision-steel enclosure by Dynamic Structures Limited, based in Port Coquitlam, British Columbia, and cutting-edge adaptive optics technologies, to be developed by the National Research Council in partnership with Canadian companies. As part of the project, dozens of Canadian businesses are expected to develop advanced capabilities and products transferable to future applications in the health, defence and telecommunications sectors – helping to create and maintain high-quality jobs in communities across Canada.

Canada's contribution will also secure a viewing share for Canadian researchers at the TMT once it is operational in 2023-2024. This access will help to maintain Canadian scientific leadership in astronomy, paving the way to important scientific discoveries and helping to train highly-qualified personnel at post-secondary institutions across the country. Canada's pursuit of new scientific discoveries will also help spark young Canadians' interest in science disciplines for decades to come.

"It was a pleasure today to announce the Government's support for the Thirty Meter Telescope project. This revolutionary facility has the potential to transform astronomers' understanding of the universe. Our Government is proud to be an official partner in this important project and to be contributing to science that will advance Canadian and international scientific discovery." *– Prime Minister Stephen Harper*



Saturn Storms Explained by Cassini Scientists

The long-standing mystery of why Saturn seethes with enormous storms every 30 years may have been solved by scientists working with data from NASA's Cassini mission. The tempests, which can grow into bright bands that encircle the entire planet, are on a natural timer that is reset by each subsequent storm, the researchers report.

In 140 years of telescope observations, great storms have erupted on Saturn six times. Cassini and observers on Earth tracked the most recent of these storms from December 2010 to August 2011. During that time, the storm exploded through the clouds, eventually winding its way around Saturn.

In a paper published online today in the journal Nature Geoscience, scientists describe the effect they believe is responsible for the periodic outbursts. The basic idea is that water vapor is heavier than the hydrogen and helium that make up the bulk of Saturn's atmosphere, so once each giant storm dumps its huge mass of rain, the air within the clouds is left lighter than the atmosphere below. For a time, this situation shuts off the process of convection -- in which warm, moist air rises, and cool, dense air sinks -- that creates new clouds and storms.

"For decades after one of these storms, the warm air in Saturn's deep atmosphere is too wet, and too dense, to rise," said Cheng Li, a graduate student at the California Institute of Technology in Pasadena, who led the study. "The air above has to cool off, radiating its heat to space, before its density is greater than that of the hot, wet air below. This cooling process takes about 30 years, and then come the storms."

Li thinks the episodic nature of the storms indicates Saturn's deep atmosphere contains more water, relative to the other atmospheric constituents, than Jupiter. The researchers suggest Saturn's extra-wet interior might explain why the planet has such epic tantrums, whereas Jupiter does not. If Saturn's deep atmosphere were drier, scientists would expect continuous, smaller storms, as observed on Jupiter, Li said. Instead, Saturn's outbursts are episodic and quite explosive.

Other observations by ground and space-based telescopes have hinted at a wet interior for Saturn. "Previous studies using spectroscopy have shown that Saturn's interior is enriched in methane and other volatiles, by two or three times, compared to Jupiter. From there, it's a short leap to expect that Saturn is also rich in oxygen, which is also a volatile and a big part of every H2O molecule," said Andrew Ingersoll, a member of the Cassini science team, also at Caltech, who co-authored the paper with Li. Volatiles are elements and chemical compounds that change from solid to liquid or gas at relatively low temperatures.

Scientists are interested in understanding the amount of oxygen and other volatile ingredients in Saturn and Jupiter. These ingredients provide important clues about the formation of the two planets -- which are thought to have formed before all the others -- and conditions in the early solar system.

The Cassini-Huygens mission is a cooperative project of NASA, ESA (European Space Agency) and the Italian Space Agency. JPL, a division of Caltech, manages the mission for NASA's Science Mission Directorate in Washington.

For previous news and images related to Saturn's giant storm: http://go.nasa.gov/1H89e3p

For more information about Cassini, visit: http://www.nasa.gov/cassini

http://saturn.jpl.nasa.gov

Jet Propulsion Laboratory Press Release

From the Simulation Curriculum Website:

SkySafari, SkyFi, SkyWire
Our award-winning SkySafari astronomy apps for iOS, Android, and Mac OS X were acquired by Simulation Curriculum Corporation. Our wireless telescope controller, SkyFi, and the SkyWire MFI-certified telescope serial cable solution we developed for iOS devices, are also now owned by SCC.

SkySafari 4 for iOS and Android is still available on the iTunes Store and Google Play. SkySafari for Mac OS X is available on the Mac App Store and from SCC's web site.

To order SkyFi and SkyWire, use Simulation Curriculum's on-line store. For technical support on these products by phone, contact Simulation Curriculum Corporation at +1 (866) 688-4175.

At our last meeting, Brett T. did a short demonstration of **Sky Safari,** an app for the iPad and iPhone. This page is provided here from the Sky Safari website as further information for that application and its various off-shoots. Sky Safari is the latest incarnation of an older Apple program called Voyager II, but it is now a popular mobile app used on Apple devices, recently made available for Android as well.

I have been using the 3.8.5 version of Sky Safari and find it very handy for looking up information at the telescope when Starry Night, (still my favourite sky simulator) is not handy. I do not usually drag my laptop out to the telescope. The only minor quibble I have with Sky Safari, is that the time display is small and stuck in a corner and the controls for advancing time are awkward. Too many steps involved. On the other hand it always shows recent comets accurately, whereas my version of SN requires a manual download of comet elements.

Now available for Android on Google Play

SkySafari 4 - $2.99, 78 MB. 120K stars, no telescope control, view from Earth.

The basic version of SkySafari 4 shows you 119,000 stars, plus 220 of the best-known star clusters, nebulae, and galaxies in the sky. It displays the Solar System's major planets and moons using NASA spacecraft imagery, and includes the best-known 500 (or so) asteroids, comets, and satellites. It accurately shows you the sky from anywhere on Earth, at any time up to 100 years in the past or future, and lets you identify stars, planets, and constellations with your iDevice's GPS, compass and/or gyroscope.

SkySafari 4 Plus - $14.99, 241 MB, 2.6M stars, telescope control, view from Solar System.

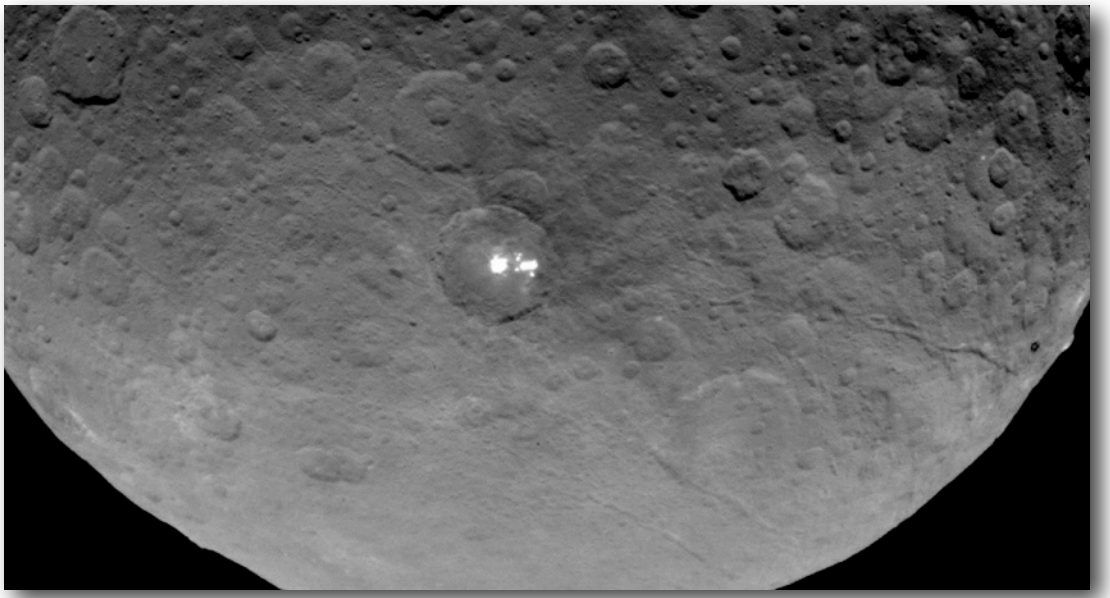
SkySafari 4 Plus adds a hugely expanded database, wired or wireless telescope control, and the ability to leave Earth and fly into orbit around any Solar System object or nearby star - to our basic version. It shows you 2.6 million stars, and 31,000 deep sky objects - including the entire NGC/IC catalog. It includes nearly 18,000 asteroids, comets, and satellites with updateable orbits. And it can point your GoTo or "Push-To" telescope anywhere in the sky, using your iPhone/iPad/iPod's built-in WiFi, and our SkyFi or SkyWire serial accessories (sold separately).

SkySafari 4 Pro - $39.99, 945 MB, 27M stars, telescope control, view from Solar System or Nearby Stars.

The all-new SkySafari 4 Pro has the largest database of any astronomy app, period. It contains everything in SkySafari 4 Plus - but also includes over 27 million stars from the Hubble Guide Star catalog generation 1 and 2, plus 740,000 galaxies down to 18th magnitude, over 620,000 solar system objects - including every comet and asteroid ever discovered - and a Moon map based on NASA's latest LRO data with 8x the resolution of any other SkySafari version. It shows you the sky with sub-arcsecond precision from anywhere on Earth, in the Solar System, or beyond, at any time up to one million years in the past or future - yet it runs just as fast and smoothly as our $3 basic version.

Ceres' White Spots Multiply in Latest Dawn Photos

by BOB KING *on* MAY 11, 2015 Universe Today



In this uncropped single frame, not only are multiple white spots visible but also long, roughly parallel cracks or troughs in Ceres' surface. Are they impact-related or caused by some other stress?
Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

See the animation here:

http://www.nasa.gov/jpl/dawn/ceres-animation-showcases-bright-spots

We don't know exactly what those mysterious white spots on **Ceres** are yet, but we're getting closer to an explanation. Literally. The latest images from the **Dawn spacecraft** taken a mere 13 400 km from the dwarf planet Ceres reveal that the pair of spots are comprised of even more spots. [Ten, by last count -ed]

"Dawn scientists can now conclude that the intense brightness of these spots is due to the reflection of sunlight by highly reflective material on the surface, possibly ice," said Christopher Russell, principal investigator for the Dawn mission from the University of California, Los Angeles. Dawn recently concluded its first science orbit, making a 15-day full circle around Ceres while gathering data with its suite of science instruments. On May 9, its ion engine fired once again to lower the spacecraft to its second science orbit which it will enter on June 6. On that date, the probe will hover just 4,400 km above the dwarf planet and begin a comprehensive mapping of the surface. Scientists also hope the bird's eye view will reveal clues of ongoing geological activity.

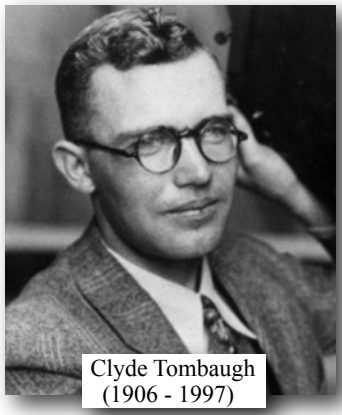
There's no doubt a lot's been happening on Ceres. One look at all those cracks hint at either impact-related stresses or some kind of crustal expansion. Geological processes may still make this little world rock and roll. Fortunately, we won't have to wait till next month for more photos. NASA plans to pause the probe twice on the way down to shoot and send fresh images.

A close examination of the image reveals some interesting features that are just as puzzling as the white spots. The "crack" running diagonally across the image above has been speculated to be caused by stresses in the crust due to an impact like those possibly associated with the 9 km crater Stickney on Phobos. Alternately, fractures could have formed as a result of crustal shrinkage as Ceres formed. Other interesting features include a very dark spot near the edge of Ceres in this image with a white spot inside it as well. And then there is the "pimple" on the limb just to the right of the dark spot. There is also a strange string of craters (upper right) that form an unusual continuous arc -perhaps vents along a fissure? or just a coincidental alignment?

Two Inspiring Explorers of the Outer Solar System

"*Dr Slipher, I have found your Planet X, ... I can show you the evidence.*"

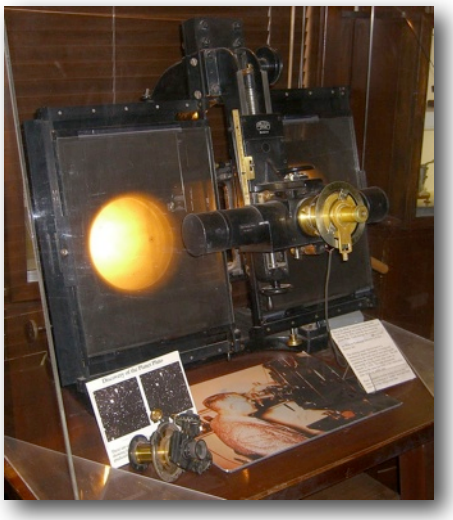
Clyde Tombaugh Announces his discovery of Pluto on Feb 18th, 1930
Recounted in Mercury Magazine, May-June, 1986



Clyde Tombaugh (1906 - 1997)

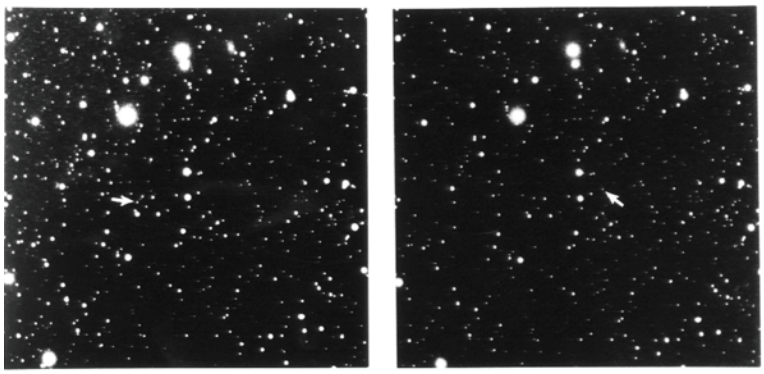
Clyde Tombaugh was in his 24th year when he discovered the first trans-Neptunian planet, Pluto, at Lowell Observatory, located in Flagstaff, AZ. Tombaugh had been hired in January, 1929, by the Observatory Director, Vesto Slipher, to continue their search for a trans-Neptunian planet. The search effort was to be undertaken using a new 13 inch triplet Cooke astrographic refractor, which had been installed in its own dome. This telescope was splendid! With guided exposures as long as 1 hour, it produced star images as small as 1/30th of a mm, on 11 by 14 inch glass plates. Because planets (wanderers) orbit the Sun they can be discovered by comparing their images recorded on pairs of photographic plates taken at different times. Clyde knew that his best chance for finding a new planet was to image the stars close to the opposition point near the ecliptic. This point is located directly opposite the position of the Sun where the Sun, Earth, and any new Planet would make a straight line. This alignment has the advantage that a distant planet would appear to move slower than the faster moving and closer asteroids.

On clear nights, Clyde Tombaugh was occupied by taking the photographs of his opposition star fields, and during daylight his time was spent developing the plates and blinking them to detect any suspicious movements. With incredible concentration Tombaugh made his plate comparisons, searching for a tiny moving speck, with a device called a"blink comparator"(image right). This procedure was not a trivial matter because each photographic plate recorded between 50,000 and 90,000 star images. Tombaugh had to take frequent breaks to clear his mind. But, here was his problem, almost any plate contained many images of moving "asteroids" and these could be confused with a new planet. Clyde had to identify and discount each one! Finding a needle in a haystack would be simpler!



Then, on February 18th, 1930, Clyde was blinking the January 23rd and January 29th star field plates (image centre) which were taken near the bright star, delta Geminorum. He noticed a faint pinprick of light, jump back and forth, not much, only about 3-4 mm. "*That's it !*" he noted in his log book .. "a suspected planet." He checked plates of the same field taken on the same night using smaller telescopes, thinking if the discovery was real, it would also appear on the other plates. And it did! That's when he went directly to Vesto Slipher's office and informed him; "*Dr. Slipher, I have found your Planet X ... I can show you the evidence*!"

DISCOVERY OF THE PLANET PLUTO



January 23, 1930 January 29, 1930

The discovery of a new planet made headlines around the world, and Clyde Tombaugh became world famous! The new planet was named Pluto, after the God of the Underworld, by Venetia Burney, an 11 year old English school girl, who was interested in mythology. Pluto became the 9th planet of the solar system and after its orbit was calculated it's distance from the Sun was found to range from 29.6 to 48.7 times the Earth's distance from the Sun [29.6 to 48.7 au]. Pluto would take more than 247 years to complete one orbit of the Sun and in the process would range in brightness from visual magnitude 13.7 to 16.3. But really, for most of the rest of the 20th century, Pluto remained a cold, distant, dark, and mysterious world.

Then, in 1978 American astronomer, James Christy discovered that Pluto had one large moon, later called Charon, which had a diameter close to 1/2 that of Pluto. This unusual circumstance led to some planetary scientists classifying the Pluto-Charon system, like our Earth-Moon system, as a double planet! Later observations of Pluto in 2005 by the Hubble Space Telescope added two new Moons, Nix and Hydra. Finally, in 2011 and 2012, Pluto was discovered to have two more moons, called Styx and Kerberos. All five Plutonian moons are grey in colour, and orbit Pluto in circular co-planar orbits. This has led to the speculation that they were formed at the same time by a major collision involving Pluto and another Kuiper Belt object. We also know that Pluto appears to have an tenuous atmosphere of methane, carbon monoxide, and nitrogen gases, which sublimate as ices onto the planet's surface during a seasonal winter and change the planet's reflectivity. Indeed, it is believed that sunlight, acting on these ices, is responsible for Pluto's reddish colour making it one of the the reddest objects in our solar system.

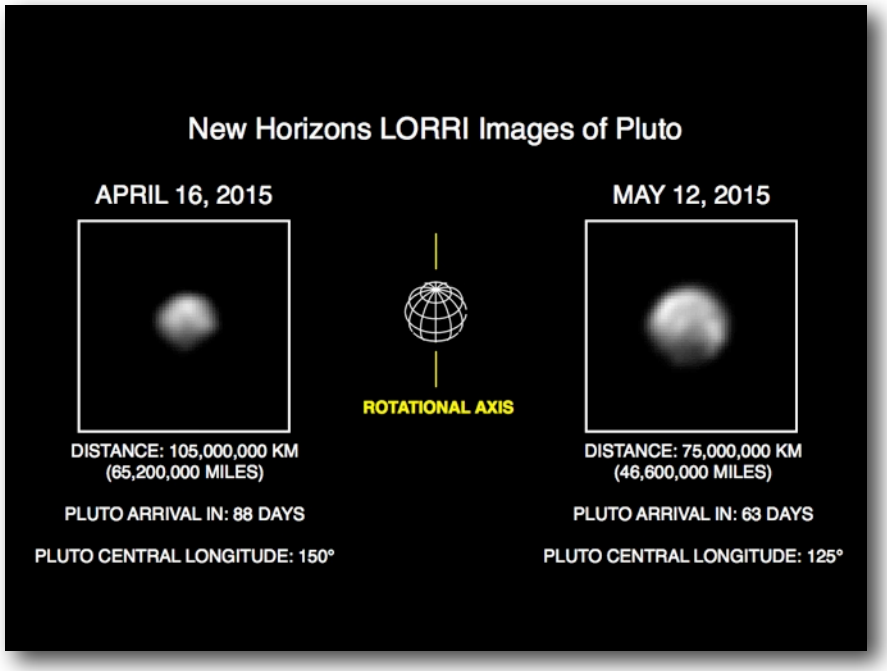
"*No question, Pluto is the bell of the ball! It has everything,... an atmosphere, ... a binary planet, ... seasons, ... volatiles, ... and a complicated satellite system* !"

Alan Stern , New Horizons Mission Principal Investigator, Interview with Carey Powell, Mar 29th, 2015, Discoverer Magazine.com

Alan Stern
New Horizons PI

Lots of questions and so few facts! Does Pluto have cryo-volcanoes? Is the planet's surface pockmarked by craters? Is there Plutonian weather system and are there major seasonal surface changes? Why is Pluto's orbit so eccentric, at times bringing it closer to the Sun than Neptune? Are we justified in classifying Pluto as a dwarf planet? How representative is Pluto as a Kuiper Belt object? What can Pluto tell us about the origin and evolution of the Kuiper Belt objects? Does Pluto hide an interior ocean of hydrocarbons or nitrogen? Does Pluto have a polar cap? Does Pluto have a magnetic field?

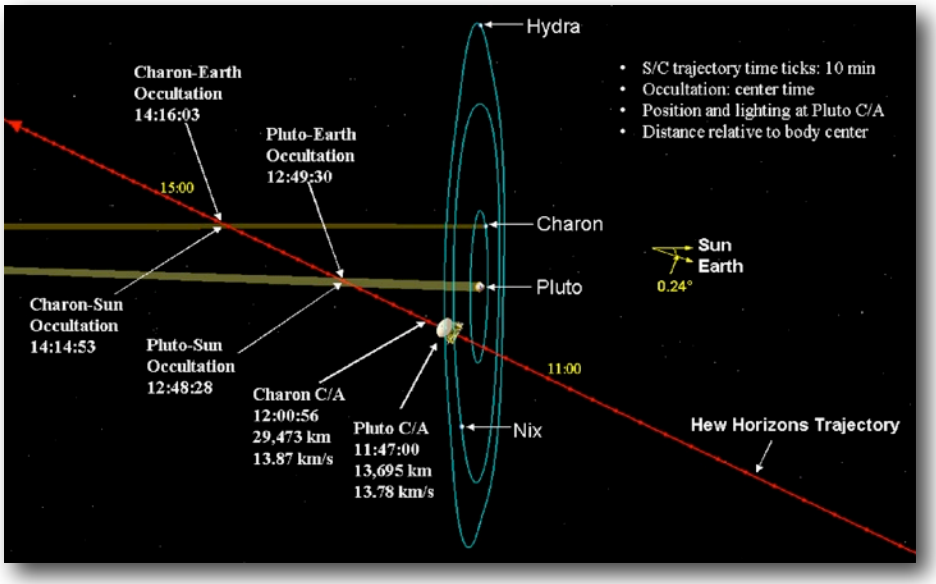
Latest images of Pluto from New Horizons (Apr 16, may 12)



The pictures above show the latest images of Pluto, taken by New Horizons cameras on April 16th and May 12th, 2015 from distances of 106 million km and 75 million km respectively. Already a possible polar cap, surface variations, and latitude differences are showing.

Our ignorance about Pluto is now about to change due to the inspired leadership of Alan Stern, Principal Investigator for the New Horizons Mission to Pluto. Time Magazine, in 2007, listed Alan Stern as one of its 100 most influential people. Alan earned a Doctorate in planetary science and astrophysics from the University of Colorado, where his research focused on the third region of our solar system, the Kuiper Belt and the Oort Cloud. Pluto is one of the largest members of the Kuiper Belt. Alan recounts the first time he seriously though about a mission to Pluto and the Kuiper Belt :

"*The summer of 1989 I was in graduate school to take a summer course in planetary exploration at CALTECH and this was the summer of the Voyager fly-by of Neptune and Triton (which has turned out to be rather a twin of Pluto). It was amazing to get to be a part of some first-time exploration like that! Within a matter of months, a small group of us had formed a team, an advocacy group.* ***Why don't we get a mission together for Pluto?***"



NASA graphic: Trajectory of New Horizons Spacecraft through Pluto System

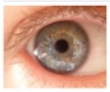
Seventeen years had elapsed from Alan's 1989 dream idea of exploring Pluto and the Kuiper Belt until the actual launch of the New Horizons Spacecraft on Jan 19th, 2006. An additional 9.5 years will pass before the New Horizons spacecraft reaches Pluto and makes its close approach on July 14th, 2015.

Certainly a long time to stay focused on a distant goal .. a total of over 26 years. But, for two days, centered on July 14th, 2015 the New Horizons spacecraft, with a close approach of only 12 500 km above Pluto's surface, should record the most detailed views of Pluto and its surface features ever!

When the transmitted data and images from the New Horizons close approach of Pluto are received and analyzed Pluto should reveal many of her secrets. An exciting new chapter in the exploration of the solar system will have been written and many of the questions posed earlier can be answered. In 2006, the IAU passed a resolution demoting Pluto to the status of a dwarf planet. Perhaps the New Horizons discoveries at Pluto may prompt another IAU resolution which could restore Pluto's status as a full fledged planetary member of our solar system. In any event, we, as amateur astronomers, are in for a special treat this July. We will be privileged to have a front row seat as the pictures of a previously unseen world are transmitted back to Earth and part of the cloak of mystery surrounding Pluto and the Kuiper Belt will be lifted! An exciting time!

Keep up to date on Pluto developments at:
http://www.nasa.gov/mission_pages/newhorizons/main/index.html

Living in a world without light



Living in a world without light
14 May, 2015
Video A short film exploring the vital role that light plays in regulating the sleep–wake cycle

http://physicsworld.com/cws/article/multimedia/2015/may/14/living-in-a-world-without-light

In recent years the medical community has discovered that people who are blind or visually impaired can still use their eyes to detect the overall amount of light in their environment. This enables them to regulate their internal body clocks in the same way as everybody else.

For people who actually have no physical eyes, however, this ability to maintain a regular sleep–wake cycle can be severely compromised. These findings have brought into question the validity of medical operations to remove people's eyes, a procedure that is sometimes performed for cosmetic reasons.

In this film we meet Meredith Plumb, who had her eyes removed after she gradually went blind following a chemistry accident.

"I don't sleep normally and I don't feel normal. I do feel that I live in a bit of a separate universe from everybody else," says Plumb, who adds that she sleeps in 90-minute and 3-hour cycles throughout the 24-hour day. Plumb has embraced her situation by becoming a person-centred counsellor who offers advice without prejudice.

One pioneering research group in this field is the Sleep and Circadian Neuroscience Institute (SCNi) at the University of Oxford in the UK, led by Russell Foster. Foster's group has identified that one in a hundred so-called ganglion cells in the eye are directly sensitive to light. Remarkably, the performance of these cells is unaffected by damage to the rod and cone cells of the visual system.

Foster and his group are developing an understanding of what genes are turned on and off as a result of light hitting the molecular clockwork of the eye. This information could be used to develop pharmacological mimics of light that could help people who have had their eyes removed to establish more regular sleep patterns.

The film is produced by London-based filmmaker Thom Hoffman, and is the second in a series commissioned by *Physics World* for the International Year of Light (IYL 2015).

In striving to reduce light pollution, amateur astronomers and other advocates often forget that light is an important part of human physiological makeup, not to mention other life forms on the planet. There is the obvious, of course, we all need light to be able to navigate in our world. The International Year of Light recognizes this and in many activities associated with IYL, is striving to educate us on what we often take for granted: our sense of sight is the biggest part of our sensory apparatus and takes the lion's share of the neural activity of our brains.

The day-night cycle is critical for good health. We need our regular daily hit of light for proper physiological health. Click on the link for the video.

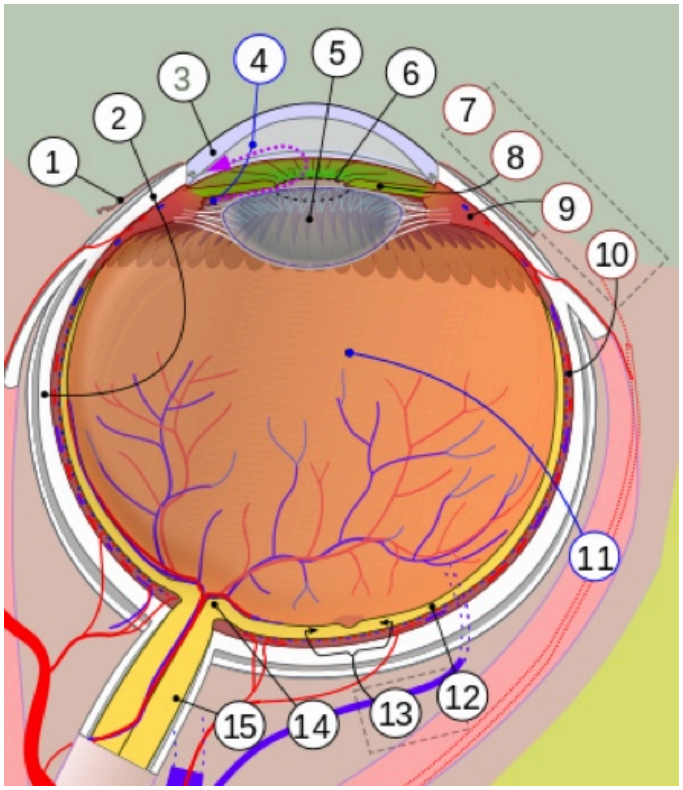


Diagram of a **human eye** (horizontal section right eye) 1. Conjunctiva, 2. Sclera, 3. Cornea, 4. Aqueous humour, 5. Lens, 6. Pupil, 7. Uvea with 8. Iris, 9. Ciliary body and 10. Choroid; 11. Vitreous humor, 12. Retina with 13. Macula or macula lutea; 14. Optic disc → blind spot, 15. Optic nerve.

Progress on the Light Pollution Front?

New LED lights for Owen Sound: *In a cost-cutting move, Owen Sound has replaced virtually all of its street lighting with less-costly-to-operate LED lights. Alerted ahead of the completion of the job by Lorraine R., your editor went out and took photos and measurements of light output before and after. A full report will appear in a future issue of SGN.* ***Image below****: 1st St E before and after new LED's.*

BAS astro-photographers keep turning out high quality images! This month offerings come from Frank Williams, Paul Zelichowski and Aaron Top.

Paul Zelichowski *took this image of* ***M81 and M82*** *using a 12-inch Hubble Optics Newtonian Astrograph with SBIG STL 11000M CCD camera. LRGB 145/45/45/39 minutes.*

Both these and M51, the Whirlpool Galaxy in Ursa Major, are high overhead this time of year and so in good position for imaging through the clear air at the zenith.

Paul's images appear on the Hubble Optics company website here: http://www.hubbleoptics.com/HNA.html

Above: Frank Williams *was busy during the dark of the Moon in April taking data for this spectacular image of the edge-on spiral* **NGC 4565 in Coma Berenices** *-a 2 hour exp. with a 12" RC and T2i running inside a DIY peltier cooling box. [Many fainter galaxies are visible as well.-ed]*

Below: Aaron Top *took this image of the* **Belt and Sword of Orion** *using a f/5.0 150 mm lens, exp. 238 s. ISO 2000. Both the Horsehead Nebula and Flame Nebula near the star Alnitak show up nicely. So does the "Running Man" Nebula near M42 , the Orion Nebula.*

From the Editor:

When I saw this image posted on Steve Irvine's Facebook page, my jaw dropped. I had never seen anything like it. I had been out watching the same auroral display (many of us were) and took hundreds of images as the aurora waxed and waned throughout the night. (For me it was an "all-nighter"). I had seen star trail images before and good aurora images, but it was an inspiration to put the two together.

As I learned about the details of how this image was taken and processed (see Steve's explanation at right) my jaw dropped even further. Steve took 265 images manually, i.e. triggering each shot by hand. That means standing in the cold (remember it was in the -6 C range that night) for 265 x 15s = 3975 seconds or 66.25 minutes. Add in setup time and perhaps two hours were spent out in the elements. My images were taken with a timer and I was sitting in a warm car drinking hot chocolate out of a thermos, had a donut too. (The Urban Dictionary defines "woose" as me that night.)

Now, it does not end there.

If you read further, in Steve's description of the processing of the images, he talks about loading the first image, then the second, then lightening the second, pasting it over the first and repeating for the third. And repeat with the 4th, 5th, 6th...all the way to the 265th. In the understatement of the year Steve says: **"then the process is repeated until all of the images are blended together."** Estimating even a minute per image, this gives about 4.4 hours of human processing time. Add a few minutes for breaks, etc., and there was about 5 hours of processing time involved!

I can only image what Steve can do if he ever buys an intervalometer and an automatic stacking program! Oh my!

Steve Irvine writes:

It's not too difficult to obtain good results with star trail aurora photos, but it does take some planning and patience. Here are the capture details for this photograph: Canon 6D, 24mm lens at f/4.5, 265 x 15 sec. exp. stacked, ISO 2000, tripod mount, Big Bay ON, March 17, 2015

To begin I carefully aimed and levelled the camera at the part of the sky where Polaris would be included. Luckily this is the part of the sky generally where most of the aurora activity also takes place. I began collecting 15 second images, starting each image immediately after the previous was finished. Some remote cable releases have an intervalometer that can be programmed to do this automatically, but mine does not, so I just stood in the field for an hour or so collecting the images. I've done this type of project with 20 second exposures which also works well, and requires less post processing since only 180 images are needed to make an hour long photograph.

To compile the images into one final photograph I launched Photoshop, and opened the first photograph in the sequence. I then opened the second image, copied it, and then pasted it on top of the first image so that it became a layer. I then used the "Lighten" blending mode for the layer. Doing this adds only the lighter parts of the second layer (i.e. new star and aurora positions) to the background layer. The third image in the sequence is then opened, and the process is repeated until all of the images are blended together. There are apps available that will do this compiling process automatically for you as well.

Steve

Virgo (Vir)

α Virginis - Spica	ε Virginis - Vindemiatrix
β Virginis - Zavijava	η Virginis -Zaniah
γ Virginis - Porrimma	ι Virginis - Syrma

Virgo is both a zodiacal and equatorial constellation. Spica, its brightest star, is about 30° southwest of Arcturus in Bootes and forms the southernmost point of the Diamond of Virgo. Spica has a magnitude of 1.2 and is the 14th of the 20 brightest stars in the sky. The autumnal equinox, where the sun crosses the celestial equator on its journey south, is located close to the star η Virginis. In the rough square formed by Denebola in Leo and ε, γ and β Virginis lies the so-called "Field of the Nebula", where Herschel discovered 323 nebulae; some of these are visible in a small telescope. [aka Virgo Cluster @ 54 Mly distance. -ed]

Double Stars

	Mag.	(s)	Location	Remarks
γ	3.6-3.7	5	123901	Both Yellow: beautiful pair.
θ	4.0-9.0-10.0	7-72	130705	White-Violet-Grey.
τ	4.0-9.0	80	135902	
17	6.2-9.0	20	122006	Pale Green-Orange
Σ1627	5.9-6.4	20	121504	

Messier Objects

	Mag	Location	Remarks
M49	8.6	122708	Elliptical Galaxy. Large, bright, between two bright telescopic stars.
M 58	9.2	123572	Spiral Galaxy.
M 59	9.6	124012	Elliptical Galaxy.
M 60	8.9	124112	Elliptical Galaxy.
M 61	10.1	121905	Spiral Galaxy.
M 84	9.3	122313	Elliptical Galaxy. [see Virgo Cluster below]
M 86	9.7	122413	Elliptical Galaxy. [see Virgo Cluster below]
M 87	9.2	122813	Elliptical Galaxy.
M 89	9.5	122313	Elliptical Galaxy.
M 90	10.0	123413	Spiral Galaxy.
M 104	8.0	123711	Spiral Galaxy. [The Sombrero Galaxy]

Other Objects of Interest

NGC4762 - A nebula resembling a kite, grouped with three stars. A beautiful sight. Location 125012

R Virginis - Long period (146 days) variable, maximum magnitude 6.9. Location 123607

S Virginis.- Long period (378 days) variable, maximum magnitude 7.0. Location 133006

Markarian's Chain is a string of a dozen Virgo Cluster galaxies that appear to have a common motion. The three brightest are M86, M84 and NGC4438/, commonly called "the Eyes". Fainter galaxies (less than 10th magnitude) continue downwards and curve to the left. Image taken in May 2013, by Frank Williams. 2 h. of exposure TeleVue 85, ISO 800, Canon T2i and DIY cooler, guided with PHD.

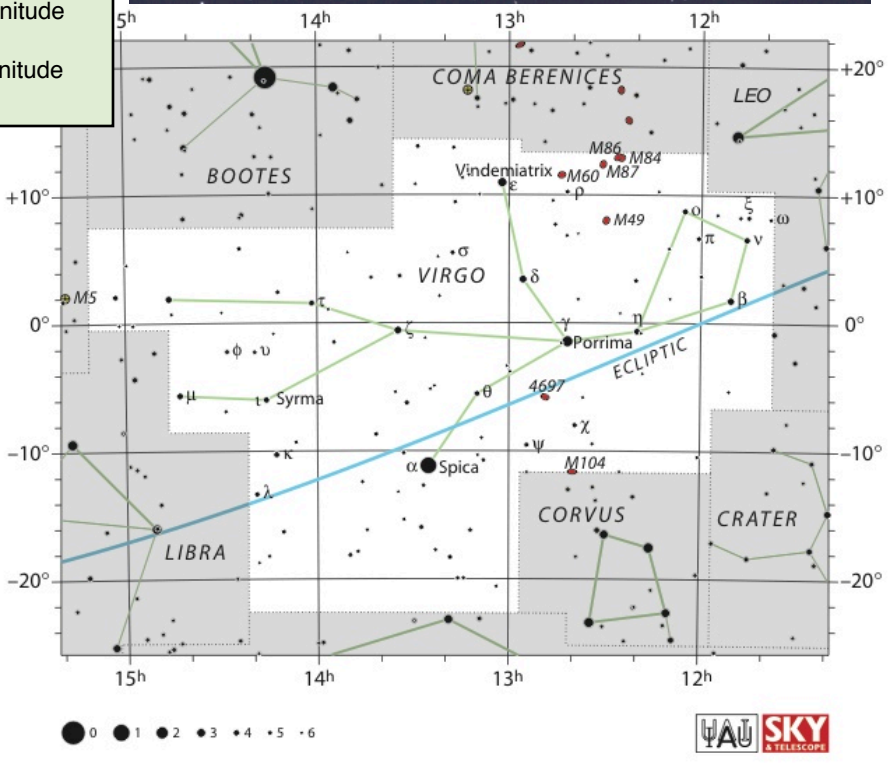
M84 M86 "the Eyes"

The Virgo Cluster of Galaxies

The **Virgo Cluster** is a cluster of galaxies at a distance of approx. 53.8 ± 0.3 Mly in the constellations Virgo and Coma Berenices. With 1300 (and possibly up to 2000) member galaxies, the cluster is the heart of the larger Virgo Supercluster, of which the Local Group is an outlying member. The cluster is approximately 8° across on the sky.

Many of the brighter Virgo galaxies, including the giant elliptical M87, were discovered in the late 1770's and early 1780's by Charles Messier where he described them as "nebulae without stars". Their true nature was not recognized until the 1920's.

The cluster is a fairly heterogeneous mixture of spirals and ellipticals. As of 2004, it is believed that the spirals of the cluster are distributed in an oblong prolate filament, approximately 4 times as long as wide, stretching along the line of sight from the Milky Way. The elliptical galaxies are more centrally concentrated than the spiral galaxies.

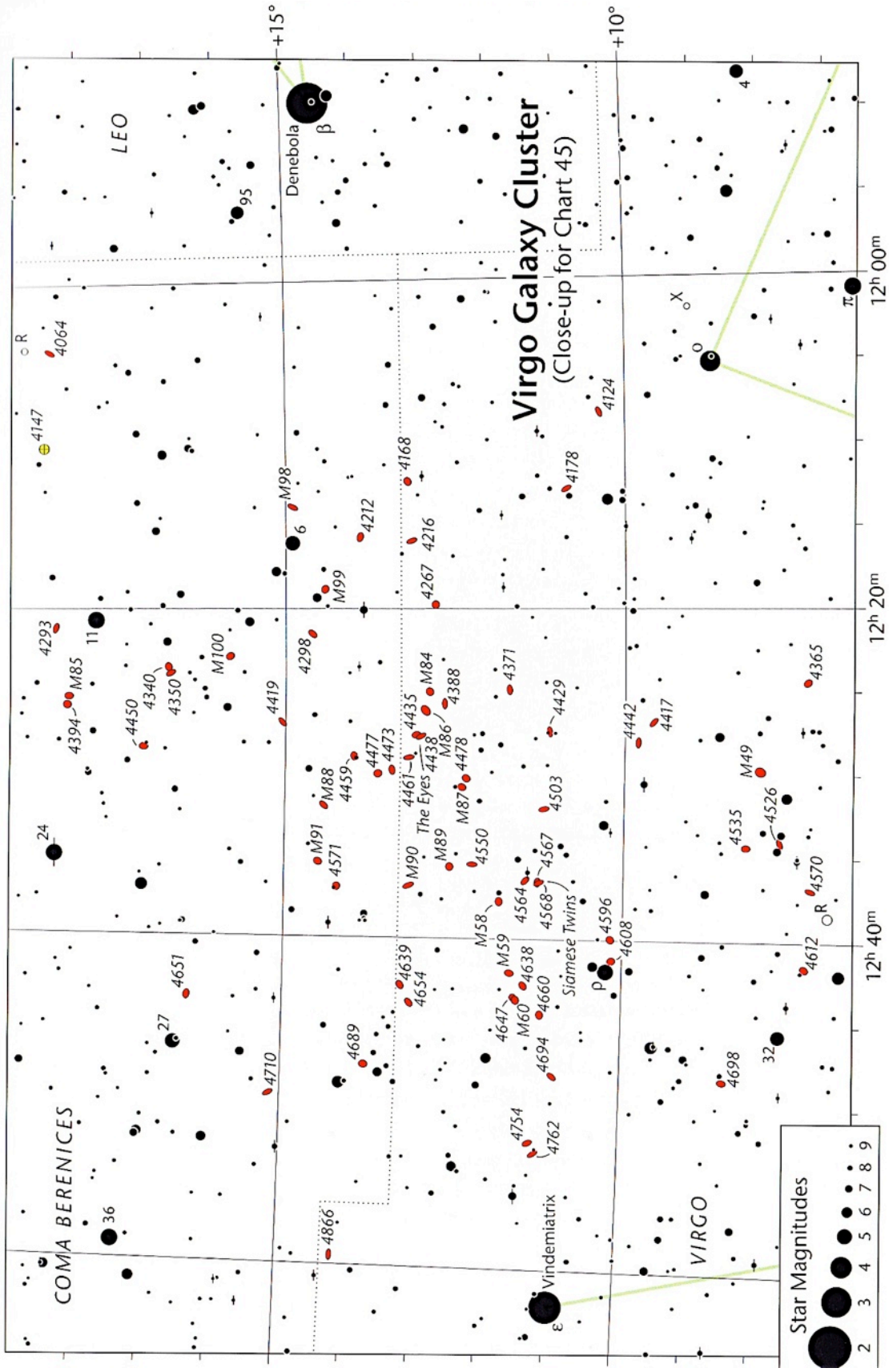


The Pocket Sky Atlas is available here:http://www.shopatsky.com/pocket-sky-atlas

The **Virgo Cluster** chart at right is a copy of the detailed map provided in the appendix of the Pocket Sky Atlas, -an enlargement of the Virgo/Coma Berenices region of chart 45 in that atlas. Markarian's Chain runs from M84 to NGC 4477 in the centre of the cluster and includes the two galaxies labelled "The Eyes".

The Virgo Cluster contains upwards to 2000 galaxies. In the brightest 160, there are only 19 ellipticals. The view through the telescope, to the eye, however, shows a preponderance of "ellipticals" and only a few spiral types. The reason is that there are a large number of S0 galaxies (the rounded spirals with no obvious arms) which masquerade as ellipticals in telescopic views. Of the top 160 galaxies, 40 are S0 types and many more are Sa spirals with tightly wound spiral arms so they resemble ellipticals as well.

There are 19 Messier objects in the cluster: 11 galaxies in Virgo and 7 galaxies and one globular cluster, M53 in Coma Berenices. M64 in Coma is the Blackeye Galaxy and M104 on the border of Corvus is the Sombrero Galaxy, -both are worth a look. Another favourite is NGC 4565 in Coma near the star γ-Com. This is a beautiful edge-on spiral with a prominent dust lane. See Frank W.'s wonderful image on pg 10. The chart at right does not show M53, M64, M101, M104 or NGC 4565. Check your other atlases or apps for these.



Messier Objects in Virgo

M 49	8.6	Elliptical.
M 58	9.2	Spiral
M 59	9.6	Elliptical
M 60	8.9	Elliptical
M 61	10.1	Spiral
M 84	9.3	Elliptical
M 86	9.7	Elliptical
M 87	9.2	Elliptical
M 89	9.5	Elliptical
M 90	10.0	Spiral
M 104	8.0	Spiral
	[The Sombrero Galaxy]	

Messier Objects in Coma Berenices

M 53	7.6	Globular Cluster. [60 000 LY]
M 64	8.8	Spiral Galaxy."Blackeye" 20 Million LY away
M 85	9.3	Spiral Galaxy.
M 88	10.2	Spiral Galaxy.
M 91	10.7	[same object as NGC 4548- ed]
M 98	10.7	Spiral Galaxy.
M 99	10.1	Spiral Galaxy. Large, bright.
M 100	10.6	Spiral Galaxy.

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

Jun **01** 16:02 Saturn 1.9°S of Moon
02 12:19 **FM** rises locally at 8:59 pm EDT
06 15:00 Venus at Greatest Elongation 45.4°E
09 11:42 **LQ Moon** rises locally at 1:27 am EDT
10 00:39 Moon at Perigee: 369 713 km
11 16:00 Uranus 0.5° N of Moon (occultation S. Pacific)
13 04:59 **Venus-Beehive: 0.5°N separation! Photo Op!**
14 11:00 Mars-Sun Conjunction
22:00 Mercury 0.04° N of Moon (occultation SE Asia)
15 06:00 **Aldebaran 1° S of Moon** (occ'n NE Canada)
16 10:05 **NM** rises locally at 6:01 am EDT
20 07:28 Venus 5.8°N of Moon
20:00 Jupiter 5° N of Moon
21 12:38 Summer Solstice
23 05:37 Mercury-Aldebaran: 1.8°N
23 13:01 Moon at Apogee: 404 134 km
24 07:03 **FQ Moon** rises locally at 1:45 pm EDT
13:00 **Mercury Greatest Elong. 22.5°W** (morning sky)
28 21:27 Saturn 2.0°S of Moon
30 Venus-Jupiter within 0.3° of each other

BAS/Astronomy Events

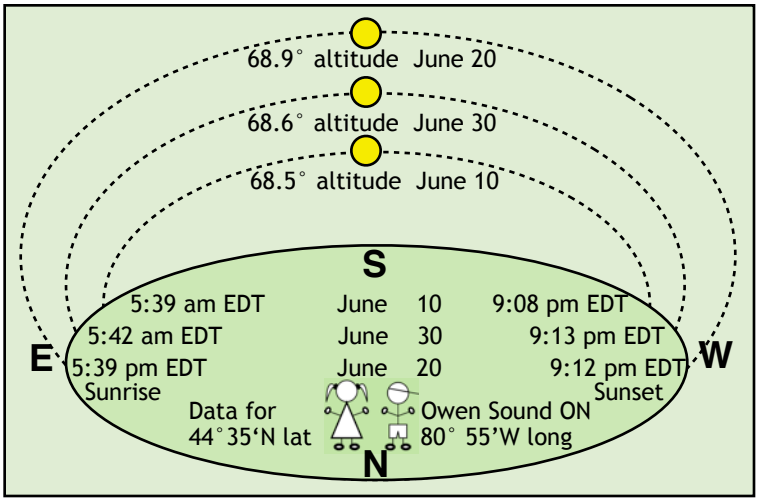
Jun 2 Tue FM
Jun 3 Wed BAS regular Wed. meeting at ES Fox Observatory. Speaker: Stuart Heggie: Astrophotography
Jun 9 Tue LQ
Jun 12 Fri **Summer Stargazing public viewing** #1 Viewing planets, clusters and galaxies in the summer sky. Event starts at dusk with Jupiter, Venus, Saturn
Jun 13 Sat **BEF Open House** (1 pm - 4 pm) at BOEC
Jun 13 Sat **BAS viewing@Fox** Dark of Moon member observing night
Jun 15 Mon **Aldebaran Occultation morning twilight** 6:08 to 6:20 am. Graze near Kenilworth. Sunrise 5:38 am
Jun 16 Tue NM
Jun 21 Sun **Keppel Henge Summer Solstice Celebration**: Welcome summer at Keppelcroft/Keppelhenge.
Jun 24 Wed FQ
Jun 27/28 Sat/Sun **AstroCATS** astronomy show Ont. Sci. Cen
Jun 30 Tue **Venus and Jupiter conjunction.** Minimum sep. 20 min. of arc. See below.

Planets

MERCURY, has switched to a morning star and is best mid-June when it rises an hour or so ahead of the Sun. It is farthest from the Sun on June 24. **VENUS,** (-4.3) is well up in the sky, slips past the Beehive on June 12/13 and then "merges" with Jupiter on June 30. See Special Events below. **MARS** is still too close to the Sun this month for viewing. **JUPITER**, (-1.8) is halfway to the western horizon at dark this month and will be setting before midnight by the end of June. Venus is very close to Jupiter in the last few weeks of June. See Special Events below. **SATURN,** (mag. 0.1) reached opposition last month and is still well placed all night long for viewing. Ring tilt is 24.3°. **URANUS,** (5.8) and **NEPTUNE,** (7.8) in Jun, are visible for 2 or 3 hours in dark sky after they rise about 3 am and 2 am respectively. Both **asteroid, Vesta (7.1)** and **dwarf planet**, **Ceres (8.3)** will be better summer objects so stay tuned. **PLUTO** (mag. 14) leads the asteroids and outer gas giants into the dawn sky and will be best placed in the summer MW in Sagittarius. Pluto 2014 charts are now found on the BAS website.

The diagram below gives the sunrise/sunset times and the Sun's altitude for June. The Sun reaches its highest point this month on June 21 when it climbs up to solstice and starts southward again.

The moon phase graphic at the bottom of this page shows the lunar phase for each night of the month. Times of moonrise for NM, FQ, FM and LQ for Owen Sound are in the Sky Calendar listing at left.



Special Events

From June 29 to July 1, if you look westward with the naked eye after dark, you might not notice two bright points of light merging into one! Venus and Jupiter will be so close over the mid-week Canada Day holiday that you will need binos to separate them. Diagram at right shows the telescope view: the familiar Jovian moons and quite nearby, a bright Venus crescent. The red circle is 60 min. across and on June 30, the two planets will be only 20 min. of arc apart! Have a look. You'll definitely like it! Send images to SGN, please.

Venus and Jupiter "merge"

June 2015

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

By permission Univ. of Texas McDonald Obs.

BAS Member Loaner Scopes

Solar H-alpha scope now available.

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

Several Dobs available.

One 12-inch dobsonian loaner telescope is available for free loan by members. Smaller 8-inchers are also available. Contact John H. or Brett T. for availability. Scopes come in and out so keep checking with John or Brett if you are interested in a loaner.

SGN Classified Ads Section

(Now also on our website)

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 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).

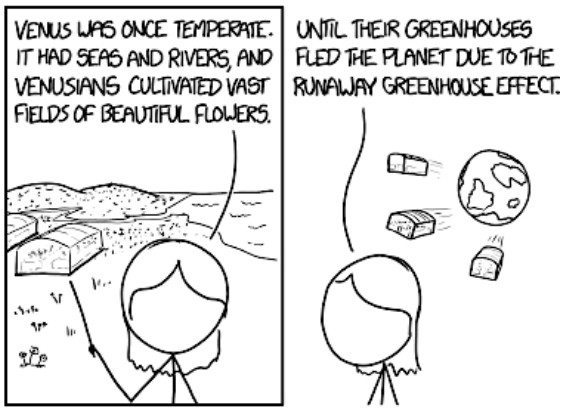
Your ad could be here!

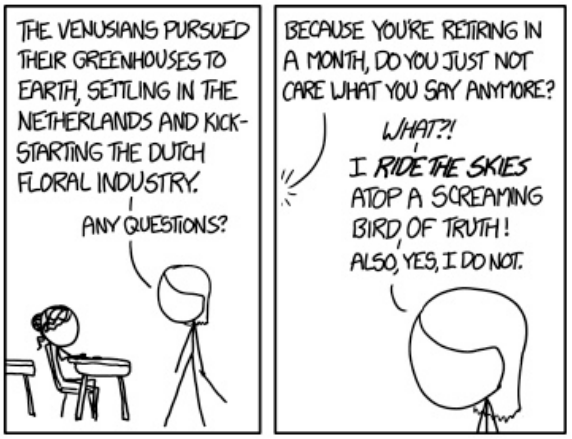
SGN will post your ads for personal astronomical items for sale/give away or wanted items. Contact the editor before publication date around the 25th of the month to get your ad placed in the subsequent issue.

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

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

The Cartoon Corner http://xkcd.com





Hubble 25th Anniversary Image

The brilliant tapestry of young stars flaring to life resemble a glittering fireworks display in the 25th anniversary NASA Hubble Space Telescope image to commemorate a quarter century of exploring the solar system and beyond since its launch on April 24, 1990.

This giant cluster of about 3,000 stars called Westerlund 2, is named for Swedish astronomer Bengt Westerlund, who discovered the grouping in the 1960s. The cluster resides in a raucous stellar breeding ground known as Gum 29, located 20,000 light-years away from Earth in the constellation Carina.

This near-infrared light image gives astronomers a clear view of the nebula and the dense concentration of stars in the central cluster. The cluster measures between 6 to 13 light-years across.

The giant star cluster is only about 2 million years old and contains some of our galaxy's hottest, brightest, and most massive stars. Some of its heftiest stars unleash torrents of ultraviolet light and hurricane-force winds of charged particles that etch at the enveloping hydrogen gas cloud.

The nebula reveals a fantasy landscape of pillars, ridges, and valleys. The pillars, composed of dense gas and thought to be incubators for new stars, are a few light-years tall and point to the central star cluster. Other dense regions surround the pillars, including reddish-brown filaments of gas and dust. The brilliant stars sculpt the gaseous terrain of the nebula and help create a successive generation of baby stars. When the stellar winds hit dense walls of gas, the shockwaves may spark a new torrent of star birth along the wall of the cavity. The red dots scattered throughout the landscape are a rich population of newly forming stars still wrapped in their gas-and-dust cocoons. These tiny, faint stars are between 1 million and 2 million years old — relatively young stars — that have not yet ignited the hydrogen in their cores. The brilliant blue stars seen throughout the image are mostly foreground stars.

Because the cluster is very young — in astronomical terms — it has not had time to disperse its stars deep into interstellar space, providing astronomers with an opportunity to gather information on how the cluster formed by studying it within its star-birthing environment. The image's central region, which contains the star cluster, blends visible-light data taken by Hubble's Advanced Camera for Surveys with near-infrared exposures taken by the Wide Field Camera 3. The surrounding region is composed of visible-light observations taken by the Advanced Camera for Surveys. The red colors in the nebulosity represent hydrogen; the bluish-green hues are predominantly oxygen.

Credit: NASA/HST