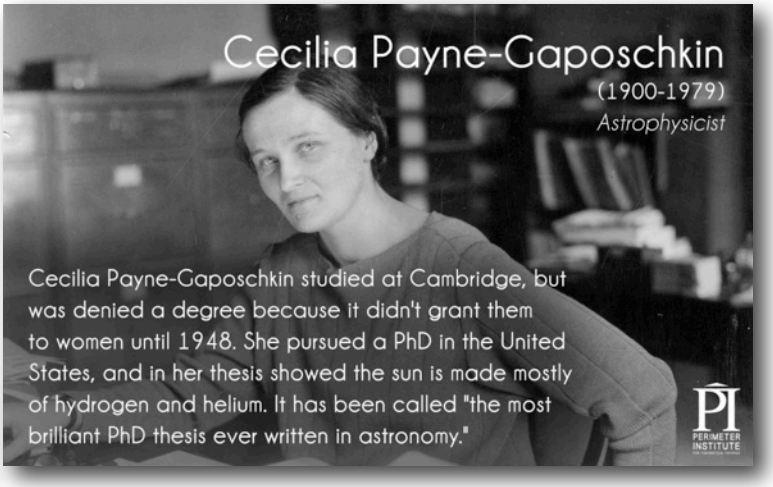
Star Gazer News

INTERNATIONAL YEAR OF LIGHT 2015

Astronomy News for Bluewater Stargazers
Vol 9 No.5 May 2015

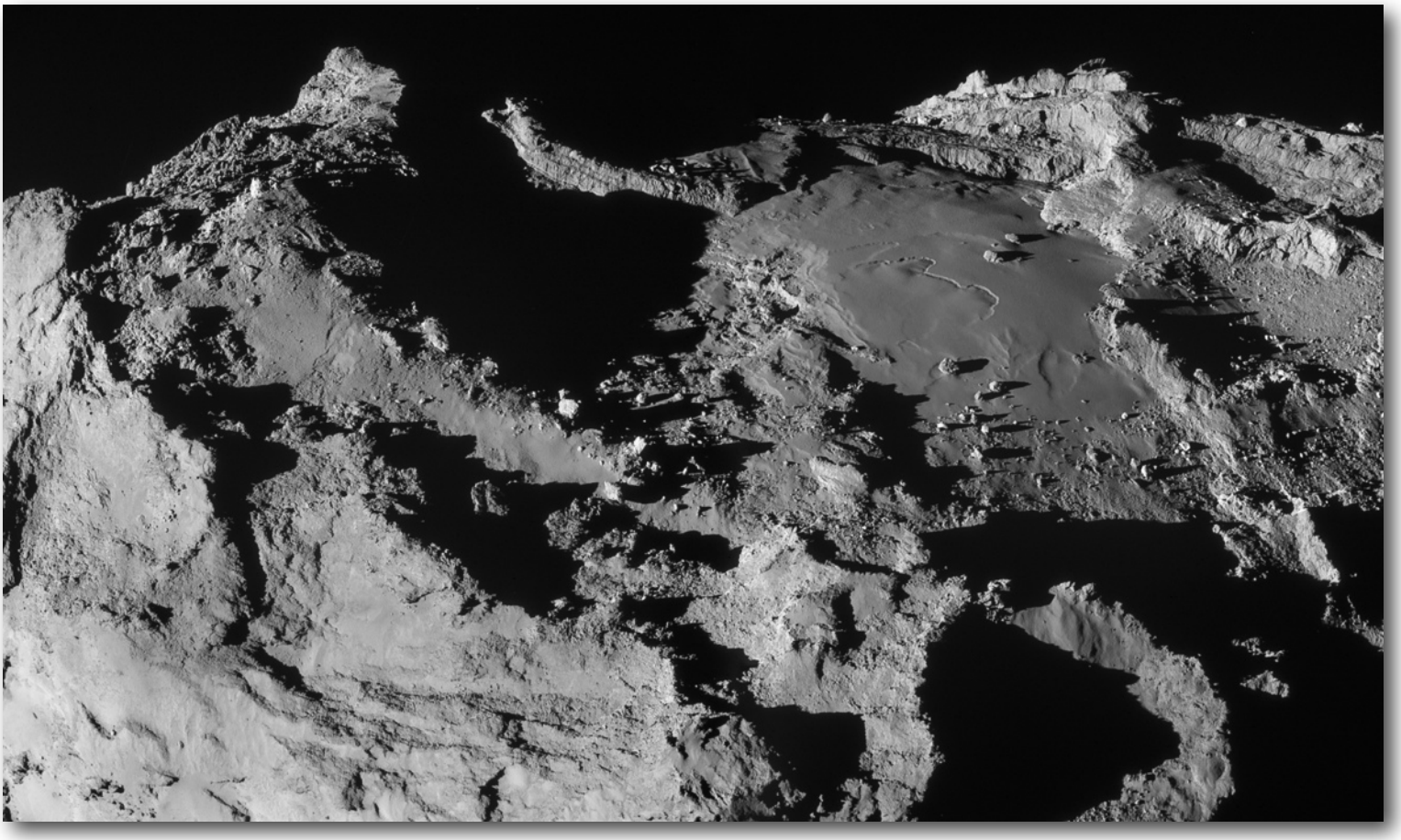
May 2015 Contents



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

Rosetta makes 14 km pass at neck region of Comet 67/P

As part of the recent series of trajectories around Comet 67P/C-G, Rosetta passed within about 14 km of the comet's surface on March 28. Despite operational difficulties encountered during the flyby, Rosetta's NAVCAM was able to acquire images on the way in to and shortly after closest approach. In this image the large lobe of the comet is to at bottom and we are looking at the neck region just below the small lobe above. The comet's 'neck' region is littered with boulders. This view also provides a good look at the many interesting, curved markings visible on the smooth surface including what looks like a lunar rille. The blocks nearby are apartment-block sized structures. Distance from top to bottom is 1700 m.
More details about this image can be found at http://rosetta.esa.int/



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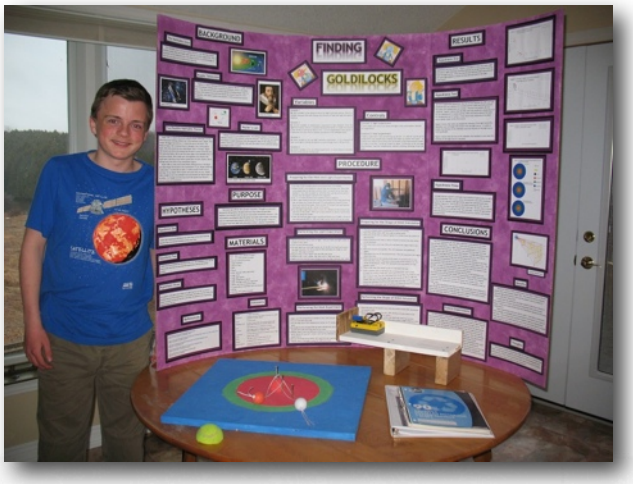
Science Fair Astronomy Award Winners



Monday April 6, 2015

Dear Mr. Hlynialuk,
Thank you so much for the Astronomy Award prizes. I am excited about reading the Sky News magazine and continuing to learn about astronomy. Also, thank you for the money and the newsletter subscription.

My project was about the Goldilocks zone which is also known as the habitable zone. It is an area in a solar system that is the right distance from the sun to be the right temprature for a planet to be able to posses liquid water and potentially life. I did two experiments and one simulation on three key factors of a planet being able to posses life. The factors I chose were light, heat and shape of a planets orbit.

Again, thank you so much for the prizes and for encouraging me to continue studying astronomy.

Sincerely,
Nick Veenstra

Nick Veenstra's project on habitable zones around planets (above) won in the Senior Fair (Gr 7&8) while the lads in the image at right won the Junior Fair Astronomy Award. Sebastian VanWieringen (L) and Quinton Rodgers (R) did a study on how the number of fins, launcher angle and weight of the rocket (among other variables) would affect the range of a rocket. The space shuttle outfit was not part of the experiment but we know where these guys are headed. Even more remarkable than the thorough job they did of analysis (check out the bar graphs), is the fact that this project was done in French and they presented it in both languages to the judges. Their video (a Noodle Boyz Production) is here: https://drive.google.com/file/d/0B5bF7s3x-nqAUllmVmc1X2kyck0/view?usp=sharing

BAS Events in May and June

May 6 Wed **BAS meets at G R Museum**: Beginners Forum
May 16 Sat **BAS viewing@Fox** featuring Saturn
May 23 Sat Star gazing with 1st OS Guides at WoL Youth Centre. Leader: John H.
May 30 Sat **HFBF star talk** & star tour (weather permitting) contact John H. if you can help with a scope
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

Note: Astronomy Events for May are listed on pg. 15

Opportunity Rover Finishes Mars Marathon, Clocks in a Time of Just Over 11 Years

There was no tape draped across a finish line, but NASA is celebrating a win. The agency's Mars Exploration Rover Opportunity completed its first Red Planet marathon Tuesday -- 26.219 miles (42.195 kilometers) – with a finish time of roughly 11 years and two months.

"This is the first time any human enterprise has exceeded the distance of a marathon on the surface of another world," said John Callas, Opportunity project manager at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, California. "A first time happens only once."

The rover team at JPL plans a marathon-length relay run at the laboratory next week to celebrate.

The long-lived rover surpassed the marathon mark during a drive of 153 feet (46.5 meters). Last year, Opportunity became the long-distance champion of all off-Earth vehicles when it topped the previous record set by the former Soviet Union's Lunokhod 2 moon rover.

"This mission isn't about setting distance records, of course; it's about making scientific discoveries on Mars and inspiring future explorers to achieve even more," said Steve Squyres, Opportunity principal investigator at Cornell University in Ithaca, New York. "Still, running a marathon on Mars feels pretty cool."

Opportunity's original three-month prime mission in 2004 yielded evidence of environments with liquid water soaking the ground and flowing on planet's surface. As the rover continued to operate far beyond expectations for its lifespan, scientists chose the rim of Endeavour Crater as a long-term destination. Since 2011, examinations of Endeavour's rim have provided information about ancient wet conditions less acidic, and more favorable for microbial life, than the environment that left clues found earlier in the mission.

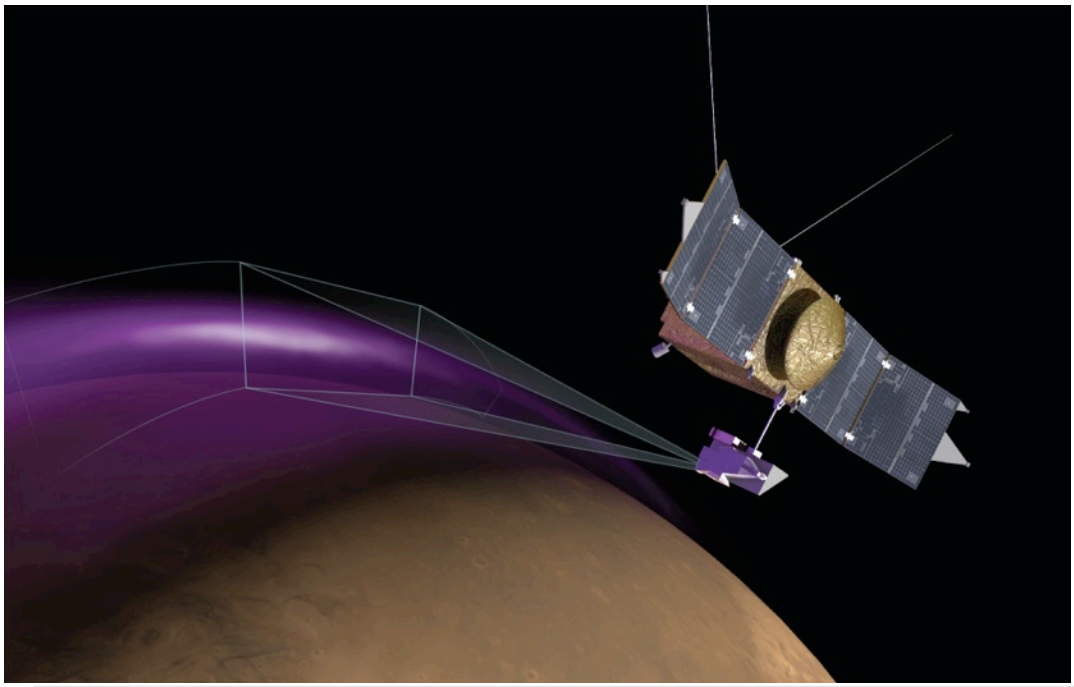
JPL manages the Mars rover projects for NASA's Science Mission Directorate in Washington. The Mars Exploration Rover Project, NASA's newer Curiosity Mars rover, and three active NASA Mars orbiters are part of NASA's Mars Exploration Program, which seeks to characterize and understand Mars as a dynamic system, including its present and past environment, climate cycles, geology and biological potential. In parallel, NASA is developing the human spaceflight capabilities needed for its journey to Mars.

For more information about Opportunity, visit

http://www.nasa.gov/rovers

This map shows the southward path driven by Opportunity from late December 2014 until it passed marathon distance on March 24, 2015, during the 3,968th Martian day, or sol, of the rover's work on Mars.
Image Credit: NASA/JPL-Caltech/Univ. of Arizona

NASA Spacecraft Detects Aurora and Mysterious Dust Cloud around Mars



Artist's conception of MAVEN's Imaging UltraViolet Spectrograph (IUVS) observing the "Christmas Lights Aurora" on Mars. MAVEN observations show that aurora on Mars is similar to Earth's "Northern Lights" but has a different origin. Image Credit: University of Colorado

NASA's Mars Atmosphere and Volatile Evolution (MAVEN) spacecraft has observed two unexpected phenomena in the Martian atmosphere: an unexplained high-altitude dust cloud and aurora that reaches deep into the Martian atmosphere.

The presence of the dust at orbital altitudes from about 93 miles (150 kilometers) to 190 miles (300 kilometers) above the surface was not predicted. Although the source and composition of the dust are unknown, there is no hazard to MAVEN and other spacecraft orbiting Mars.

"If the dust originates from the atmosphere, this suggests we are missing some fundamental process in the Martian atmosphere," said Laila Andersson of the University of Colorado's Laboratory for Atmospherics and Space Physics (CU LASP), Boulder, Colorado.

The cloud was detected by the spacecraft's Langmuir Probe and Waves (LPW) instrument, and has been present the whole time MAVEN has been in operation. It is unknown if the cloud is a temporary phenomenon or something long lasting. The cloud density is greatest at lower altitudes. However, even in the densest areas it is still very thin. So far, no indication of its presence has been seen in observations from any of the other MAVEN instruments.

Possible sources for the observed dust include dust wafted up from the atmosphere; dust coming from Phobos and Deimos, the two moons of Mars; dust moving in the solar wind away from the sun; or debris orbiting the sun from comets. However, no known process on Mars can explain the appearance of dust in the observed locations from any of these sources.

MAVEN's Imaging Ultraviolet Spectrograph (IUVS) observed what scientists have named "Christmas lights." For five days just before Dec. 25, MAVEN saw a bright ultraviolet auroral glow spanning Mars' northern hemisphere. Aurora, known on Earth as northern or southern lights, are caused by energetic particles like electrons crashing down into the atmosphere and causing the gas to glow.

"What's especially surprising about the aurora we saw is how deep in the atmosphere it occurs - much deeper than at Earth or elsewhere on Mars," said Arnaud Stiepen, IUVS team member at the University of Colorado. "The electrons producing it must be really energetic."

The source of the energetic particles appears to be the sun. MAVEN's Solar Energetic Particle instrument detected a huge surge in energetic electrons at the onset of the aurora. Billions of years ago, Mars lost a global protective magnetic field like Earth has, so solar particles can directly strike the atmosphere. The electrons producing the aurora have about 100 times more energy than you get from a spark of house current, so they can penetrate deeply in the atmosphere.

The findings are being presented at the 46th Lunar and Planetary Science Conference in The Woodlands, Texas.

MAVEN was launched to Mars on Nov. 18, 2013, to help solve the mystery of how the Red Planet lost most of its atmosphere and much of its water. The spacecraft arrived at Mars on Sept. 21, and is four months into its one-Earth-year primary mission.

"The MAVEN science instruments all are performing nominally, and the data coming out of the mission are excellent," said Bruce Jakosky of CU LASP, Principal Investigator for the mission.

MAVEN is part of the agency's Mars Exploration Program, which includes the Opportunity and Curiosity rovers, the Mars Odyssey and Mars Reconnaissance Orbiter spacecraft currently orbiting the planet.

NASA's Mars Exploration Program seeks to characterize and understand Mars as a dynamic system, including its present and past environment, climate cycles, geology and biological potential. In parallel, NASA is developing the human spaceflight capabilities needed for its journey to Mars or a future round-trip mission to the Red Planet in the 2030's.

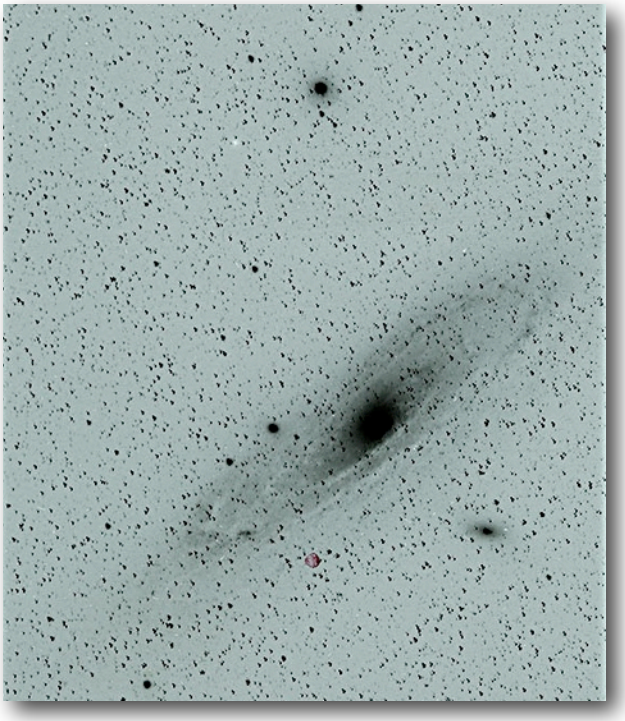
MAVEN's principal investigator is based at the University of Colorado's Laboratory for Atmospheric and Space Physics, and NASA's Goddard Space Flight Center in Greenbelt, Maryland, manages the MAVEN project. Partner institutions include Lockheed Martin, the University of California at Berkeley, and NASA's Jet Propulsion Laboratory.

For images related to the findings, visit:

http://www.nasa.gov/maven

Using 19th Century Technology to Time Travel to the Stars

by NANCY ATKINSON MAR 25, 2015 Universe Today



This image of M31 taken on a glass photographic plate, is one in a series of photos taken over decades. From the Harvard Plate collection. Image courtesy American Museum of Natural History. [A close look shows tracking was not that great. BAS astrophotographers have done as well or better -a testament to how far we have come in imaging in astronomy.-ed]

In the late 19th century, astronomers developed the technique of capturing telescopic images of stars and galaxies on glass photographic plates. This allowed them to study the night sky in detail. Over 500,000 glass plate images taken from 1885 to 1992 are part of the Plate Stacks Collection of the Harvard-Smithsonian Center for Astrophysics (CfA), the largest [collection] of its kind in the world.

"The images captured on these plates remain incredibly valuable to science, representing a century of data on stars and galaxies that can never be replaced," writes astronomer Michael Shara, Curator in the Department of Astrophysics at the American Museum of Natural History in New York City, who discussed the plates and their significance in a new episode of AMNH's video series, "Shelf Life."

These plates provide a chance to travel back in time, to see how stars and galaxies appeared over the past 130 years, allowing astronomers to do what's called "time domain astronomy": studying the changes and variability of objects over time. These include stars, galaxies, and jets from stars or galactic nuclei.

The glass plates can still be viewed on a rather archaic plate viewer—a device that's like an X-ray light box in a doctor's office. But those aren't readily available, and Harvard is hesitant about shipping the 100-plus-year-old glass plates around the world. If astronomers travel to Cambridge to dig through the archives, they can spend hours pouring over logbooks or just looking for the right plate. Plus, there's not an easy way to compare these plates to today's digital imagery.

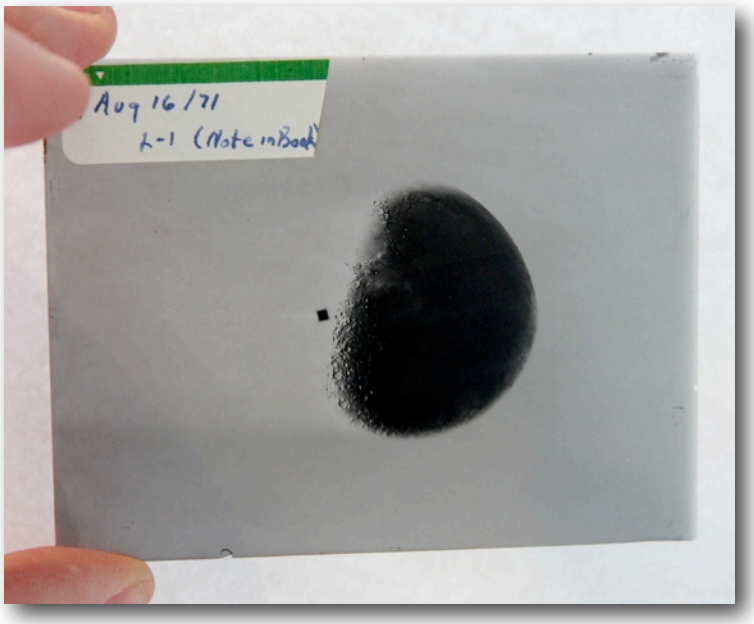
AMNH is helping CfA to digitize the glass plates, which is discussed in the video. There's also a citizen science project called DASCH to help digitize the telescope logbooks record that hold vital information associated with a 100-year-long effort to record images of the sky. By transcribing logbook text to put those historical observations in context, volunteers can help to unlock hidden discoveries.

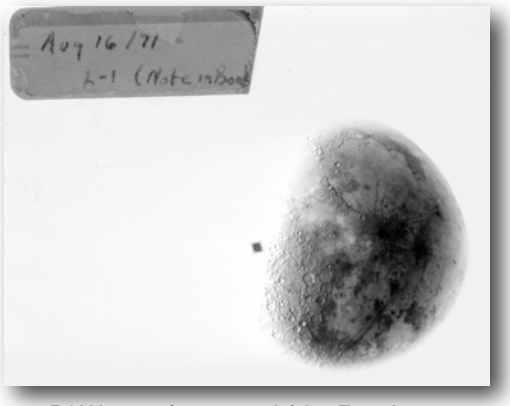
Find out more about DASCH here, and the news release from last year here.

Find out more about AMNH's digitization project here, where you can also see more episodes of "Shelf Life."

Vernonscope Plate "Library" by John H.

The University of Guelph donation of the 12-inch telescope in 2005 came with a number of other items as well. One of these was a small collection of 3x4-inch glass plates. Some had images of Jupiter taken at prime focus and one was the nice Moon image below. The Aug 16/71 date of the image is obvious and a note below reads "2-1 (Note in Book)". There is an odd object in the centre which may be an artifact but it looks like a double exposure of a bright star or planet complete with diffraction spikes. Note also that there is a whitish swath on the plate image (left) extending to the left of both the Moon and the "artifact" as if light leaked in while the plate was slid into the plate holder.





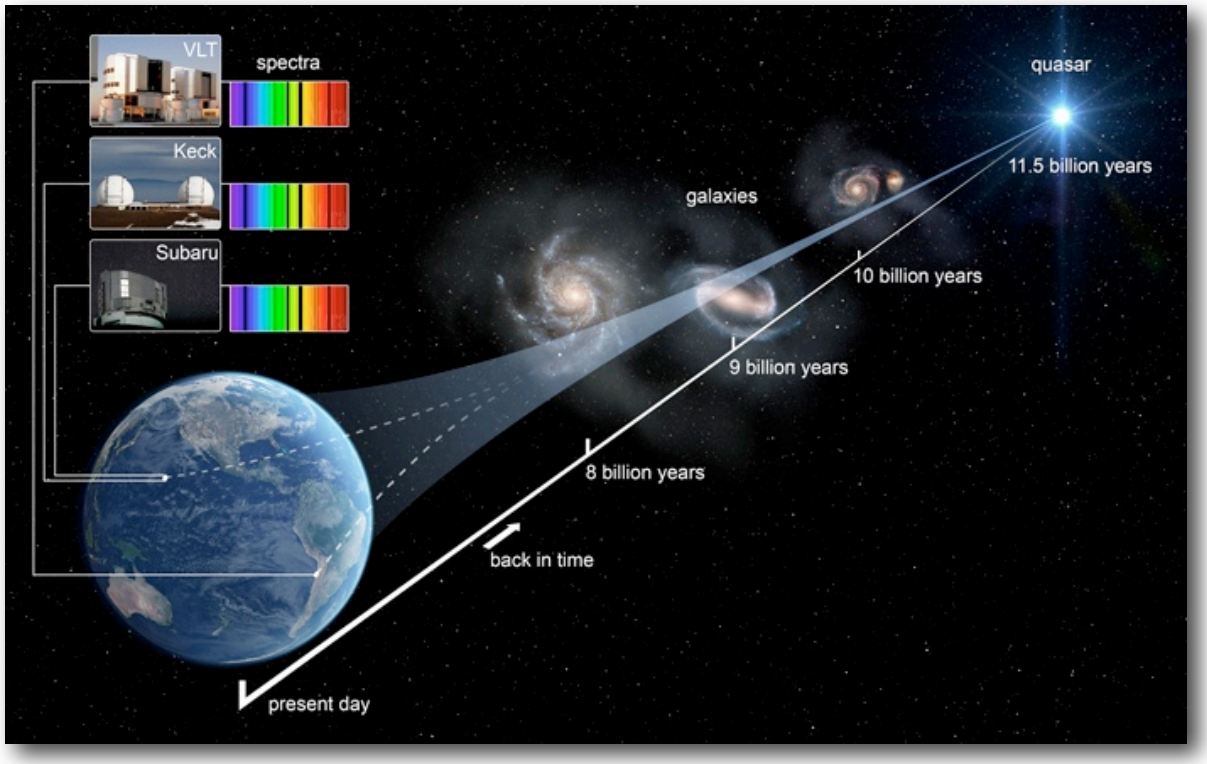
B&W scan (same scale) by FotoArt.

The image was probably taken at Cassegrain prime focus (5112 mm focal length) although the scope came to us with a newtonian focuser at about 1100 mm focal length. The camera that came with the plates looked like it bolted directly onto the back of the scope. A ground glass viewing screen was apparently used for focusing before the plate camera was attached. No live focusing was possible. There is no obvious shutter mechanism on the camera and it was probably meant for longer exposures of deep sky objects and not the short precise exposures needed for planets and the Moon. This image probably involved the old "hat trick" method -an opaque screen is held at the top of the tube and momentarily removed to allow light to expose the image. They must have been lucky with this one exposure or (maybe) threw away the poorly exposed plates.

Quasar spectrum shines a new light on unchanged fundamental constants

from Physics World

Astronomers studying the spectrum of a distant quasar have found that the ratio between the mass of the proton and that of the electron is constant – its value 12.4 billion years ago was identical to its value today – with a precision of 10^{-6}. The study is crucial if physicists are to test theories that go beyond the Standard Model, as well as the nature of the mysterious dark energy that is accelerating the expansion of the universe. The results allude to the fact that dark energy – if it exists – has remained unchanged since the universe's early days.



Measuring changes in the fundamental constants throughout the history of the universe is achieved by studying quasar light absorbed by foreground galaxies at different times. As well as measuring the proton–electron mass ratio, last year Michael Murphy was also part of a team using this method and data from the VLT, Keck and Subaru observatories to search for variations in the fine-structure constant. (Courtesy: Swinburne Astronomy Productions)

Using data gathered by the European Southern Observatory's Very Large Telescope (VLT) in Chile, the team of astronomers, led by Julija Bagdonaite of VU University of Amsterdam, made use of light from a quasar – a distant galaxy powered by a hugely energetic and luminous supermassive black hole – shining through a "foreground" galaxy. In this case, the foreground galaxy itself existed 12.4 billion years ago, at a redshift of 4.22, when the universe was barely a 10th of its current age, while the quasar, at a redshift of 4.42, is even more distant. Molecular hydrogen in the foreground galaxy absorbs the quasar's light, so that it is possible to detect specific energy transitions thanks to their recognizable spectral features. Should the value of the mass ratio "μ" be different, it would shift the levels of the energy transitions in the hydrogen.

Varying constants?

The mass of the proton – 1.67×10^{-27} kg – and the mass of the electron – 9.11×10^{-31} kg – are fundamental constants, along with other supposedly invariable properties such as Planck's constant, the speed of light and the gravitational constant. The values of these constants cannot be derived from theory; as far as we can tell, they just *are*. However, some speculative theories that attempt to take physics beyond the Standard Model predict that these constants can change. The presence of scalar fields in the universe – fields with a single mathematical quantity that inhabit every point in space, such as dark energy's quintessence or the Higgs field – may provide a means for this variance.

"Such scalar fields are likely to interact with fundamental particles such as electrons and quarks, and possibly affect how massive they appear," says team member Michael Murphy of the Swinburne University of Technology in Melbourne, Australia. "It is possible that scalar fields, including a quintessence field, may cause variations in the fundamental constants, including μ." The universe spent the first half of its life gradually transitioning from a matter (gravity)-dominated cosmos to a universe dominated by dark energy. Should μ be found to be different on either side of this transition, it would hint at the nature of dark energy. As well as measuring the proton–electron mass ratio, last year Murphy was also part of a team using this method and data from the VLT, Keck and Subaru observatories to search for variations in the fine-structure constant.

Methanol measurements

In 2013 Bagdonaite and co-author Wim Ubachs, also from VU Amsterdam, were part of a team that constrained any variation in μ to less than 10^{-7} in a galaxy that existed seven billion years ago, based on energy transitions in the spectra of methanol in interstellar clouds. This is an order of magnitude more precise than the new measurement, but it is much more difficult to make these measurements at higher redshifts. Rodger Thompson of the University of Arizona, who has made previous measurements of μ but who was not involved in the current research, says that the team's result is very important as "it is the highest redshift limit on the variance of μ that exists".

The results do not signal the end for unchanging constants. Indeed, Bagdonaite told *physicsworld.com* that "finding a variation at, say, the 10^{-9} level would be just as exciting and revealing, and I think that efforts to improve on the current limits will continue".

The research is published in *Physical Review Letters*.

About the author

Keith Cooper is a science journalist based in the UK. This article appeared on physicsworld.com newswire on Feb 26, 2015.

Imaging Ancient Star Cities

"*It was as if a globe had been filled with moon-light and hung before them in a net woven of the glint of frosty stars ..*"

J.R. Tolkien "The Hobbit" Recounted by Robert Burnham to describe globular clusters

Interesting how it is so easy to get side-tracked .. at least for me! Isaac Newton touched briefly on this when he described his fascination with the natural world ..

" I *was like a boy, playing on the sea-shore, and diverting myself now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all discovered before me*."

Isaac Newton

The editor of Astronomy magazine, David Eicher, when he was a young teenager, got side-tracked and it changed his life. He was shown a globular star cluster through a good telescope. It was probably Messier 13. He writes about that experience,

"*I came away from that night reeling with excitement, as if I had been let in on a closely guarded secret. I was keenly aware, as never before, that out beyond the blue sky lay vast numbers of stars and countless worlds unseen*." David Eicher

As most readers of my column know, my wife, Paula, and I spend the better part of the winter at Arizona Sky Village (ASV). We spend our time enjoying the fellowship of the many residents, hiking in the Chiricauhua Mountains, and, of course, pursuing our passion for astronomy. The winter night skies this year at Arizona Sky Village were not the same quality as in previous years. We had more clouds, winds, some rain, and, of course, moonlight, to interfere with our astronomy imaging/observing. In fact, the best astronomy period we experienced were the last two weeks of March. Since we were scheduled to leave Arizona Sky Village on Monday, March 30th, for our 4-day drive home, I wanted to take advantage of every clear night. Well, the prospects for astronomy were ideal on Saturday morning, March 28th, and I decided to stay up all night. That's when I got side-tracked!

Globular Cluster M22 *in Sagittarius, March 29th, 2015, ASV 300,000 stars, 100 LY diameter, 10,600 LY distant, 12 billion years old. Canon 60Da, TAK TOA, Exp 2.5 minutes, ISO 3200, FOV 2.5 deg (Photo by Doug Cunningham)*

My imaging project for that night was to concentrate on the Barnard Dark Nebulae, like the famous Ink Drop in Sagittarius, a B86/NGC 6520 combination. Later on in the morning I noticed Omega Centauri rising towards the Chiricauhua Mountains just east of the village of Portal. At the latitude of Arizona Sky Village, about 32 degrees N, Omega Centauri, although naked eye visible, doesn't gain a lot of altitude. I checked it out visually with my Canon IS binoculars, and then with my TAK FSQ 106. Really, the telescopic view in the FSQ 106 was quite splendid! I now had the Milky Way's largest globular cluster, Omega, with its 4 million stars in sight. It occupied an area on the celestial sphere similar to that subtended by the Moon (one half of a degree) and was a wonderful sight from ASV's 7.5 visual magnitude Arizonan skies! By this time in the morning, many of the Milky Way's great globulars, visible from that latitude, were now prominent. I abandoned my original quest to image some of the Barnard Dark Nebulae. Instead, I decided to compile a set of comparison images of these globular clusters using similar exposures, camera ISO's, telescope/camera combinations, and processing routines. In this article, I have included 3 of my images from that morning.They all are presented at the same scale so you can compare the globulars' relative sizes and structures.That is one of the great advantages of imaging the universe. Pictures provide a great degree of objective information about the objects imaged.

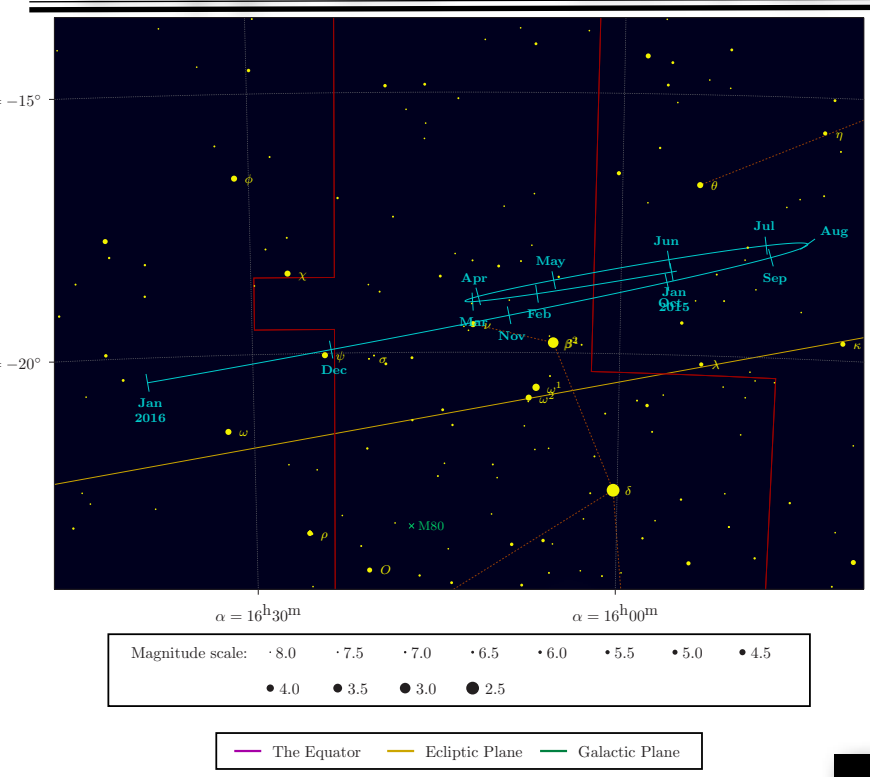
Now. astrophotography is enjoyable, technically challenging and expensive, but quite fun. Astrophotography occupies about half of my time under the stars. Having said that, for Paula and myself, the greatest joy of amateur astronomy is seeing first-hand these wonderful celestial objects at the eyepiece. For us the real achievement is seeing with both our eyes and the minds. That is the real reason we purchased a large Dobsonian. We have accumulated a lot of observing experience over the many decades that we have pursued the hobby. But our experience pales when compared with Texan deep sky observer, Barbara Wilson. Barbara is one of the world's most skilled and accomplished astronomy observers. As an amateur astronomer, she takes great delight in seeing, first hand at the telescope eyepiece, some for the most distant objects in the universe. She lives near Houston, Texas, where she teaches astronomy at George Observatory. Regarding globular star clusters, Barbara has observed 147 of the approximately 160 that orbit the Milky Way. The ones she has missed are too far south of her Texas latitude to come above her horizon. In addition, Barbara has observed every one of 2500 deep sky objects that William Herschel catalogued. Her attraction to astronomy mirrors that motivation behind every amateur's joy in experiencing the natural world :

"*Its all so beautiful and it makes you feel good to be alive ! Everything is so detailed, and the closer you look the more detailed it gets. It's a wonderful world - a wonderful universe - we live in. To me it's a visual world, and I just want to see.*"
Barbara Wilson

Seeing with the mind, the globular clusters that I imaged that early March morning, contain some of the oldest stars in the universe. They formed about 12 billion years ago. Their distribution about our Milky Way permitted Harlow Shapley, in 1920, to determine the size of our Milky Way galaxy and locate its centre. Those are the facts. But, it was the splendid, beautiful view of Omega Centauri in my TAK FSQ 106 on the March morning that got me side-tracked and changed my imaging plans.

Globular Cluster, M13 *in Hercules, March 29th, 2015, ASV 300,000 stars, 168 LY diameter, 22,200 LY distant, 11.6 billion years old Canon 60Da, TAK TOA, Exp 2.5 minutes, ISO 3200, FOV 2.5 deg (Photo by Doug Cunningham)*

Globular Cluster, Omega Centauri, in Centaurus, March 29th, 2015, ASV 4,000,000 stars, 172 LY diameter, 15,800 LY distant, 11.5 billion years old Canon 60Da, TAK TOA, Exp 2.5 minutes, ISO 3200, FOV 2.5 deg (Photo by Doug Cunningham)



This month, Saturn will be well placed for observation in the constellation Libra. Visible for much of the night, it reaches its highest point in the sky at around midnight local time.

From Owen Sound/ES Fox, Saturn is above the horizon, technically, between 2030 DST and 0600 DST. It will become accessible at around 10 pm, when it rises 12° above the SE horizon, and then reach its highest point in the sky at 01:24 am DST, 27° high. It will become inaccessible at around 04:50 when it sinks to 11° above the SW horizon and is down in the trees to the west of the Observatory.

Saturn in coming weeks

Over the weeks following its opposition, Saturn will reach its highest point in the sky four minutes earlier each night, gradually receding from the pre-dawn morning sky while remaining visible in the evening sky for a few months.

A chart of the path of Saturn across the sky in 2015 is displayed at left.

LEFT: *Saturn retrogrades from mid-March to Aug passing into Libra as it does so. It recrosses Scorpius from mid-Oct to Dec and stays in Sagittarius for all of 2016.*
Credit: *in-the-sky.org*

The geometry of the solar system

This optimal positioning occurs when Saturn is almost directly opposite the Sun in the sky. Since the Sun reaches its greatest distance below the horizon at midnight, the point opposite to it is highest in the sky at the same time.

At around the same time that Saturn passes opposition, it also makes its closest approach to the Earth – termed its perigee – making it appear at its brightest and largest.

This happens because when Saturn lies opposite the Sun in the sky, the solar system is lined up so that Saturn, the Earth and the Sun form a straight line with the Earth in the middle, on the same side of the Sun as Saturn.

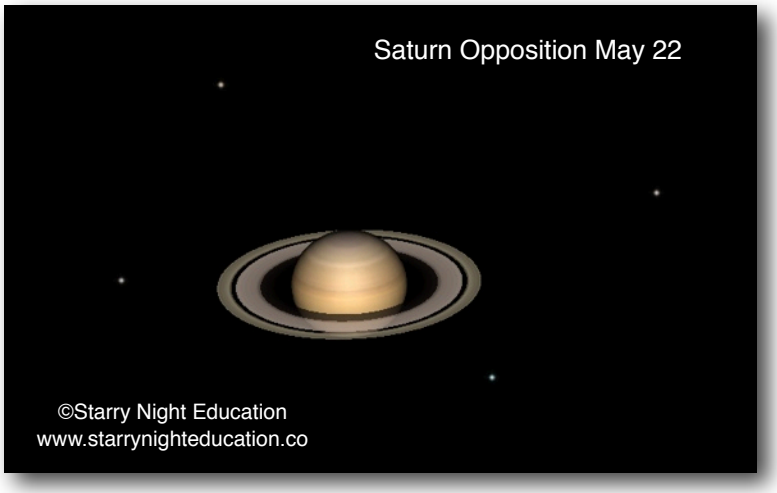
In practice, however, Saturn orbits much further out in the solar system than the Earth – at an average distance from the Sun of 9.56 times that of the Earth, and so its angular size does not vary much as it cycles between opposition and solar conjunction.

On this occasion, Saturn, shining at magnitude 0.02, will lie at a distance of 8.97 AU, and its disk will measure 18.5 arcsec in diameter (the Moon at around 1900 arcsec is 104 times larger!). Even at its closest approach to the Earth, however, it is not possible to distinguish Saturn as more than a star-like pointof light without the aid of a telescope.

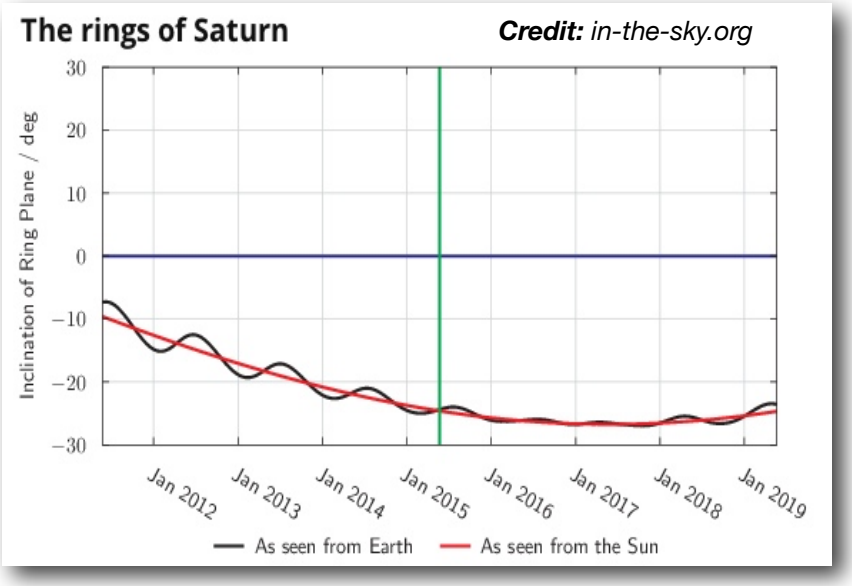
For a few hours around the exact moment of opposition, it may be possible to discern a marked brightening of Saturn's rings in comparison to the planet's disk, known as the Seeliger Effect. This occurs because Saturn's rings are made of a fine sea of ice particles which are normally illuminated by the Sun at a slightly different angle from our viewing angle, so that we see some illuminated particles and some which are in the shadow of others. At around the time of opposition, however, the ice particles are illuminated from almost exactly the same direction from which we view them, meaning that we see very few which are in shadow.

Source

The circumstances of this event were computed from the DE405 ephemeris published by the Jet Propulsion Laboratory (JPL).



Saturn's rings continue to widen and reach a maximum of 26.6° in June of 2017. This year on May 22 the angle is 24.4°. We are looking down on the northern hemisphere of the planet.

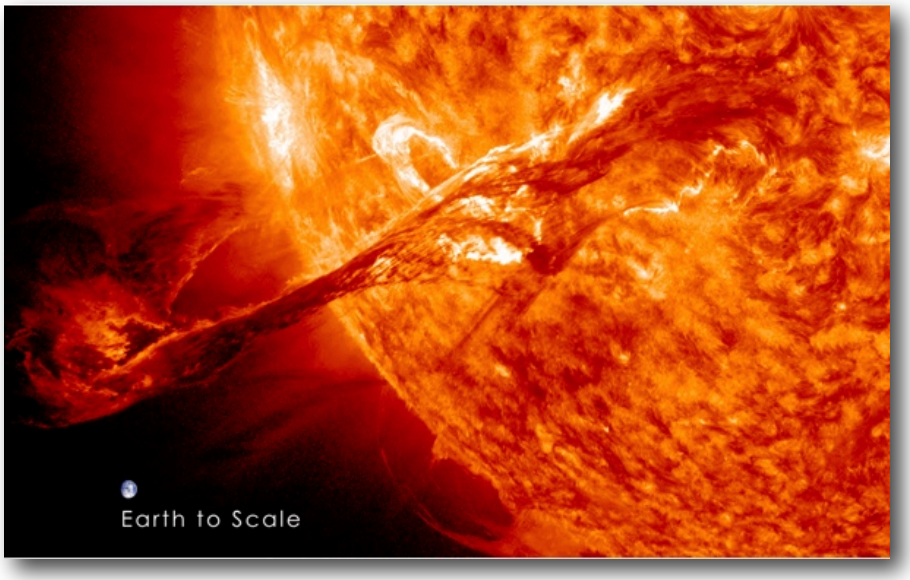


SUN EXPERIENCES SEASONAL CHANGES
New Research Shows

NCAR UCAR University Corporation for Atmospheric Research

April 07, 2015
BOULDER – The Sun undergoes a type of seasonal variability, with its activity waxing and waning over the course of nearly two years, according to a new study by a team of researchers led by the National Center for Atmospheric Research (NCAR). This behavior affects the peaks and valleys in the approximately 11-year solar cycle, sometimes amplifying and sometimes weakening the solar storms that can buffet Earth's atmosphere. The quasi-annual variations appear to be driven by changes in the bands of strong magnetic fields in each solar hemisphere. These bands also help shape the approximately 11-year solar cycle that is part of a longer cycle that lasts about 22 years.

"What we're looking at here is a massive driver of solar storms," said Scott McIntosh, lead author of the new study and director of NCAR's High Altitude Observatory. "By better understanding how these activity bands form in the Sun and cause seasonal instabilities, there's the potential to greatly improve forecasts of space weather events."



NASA instruments captured detailed images of this coronal mass ejection on Aug 31, 2012 which struck just a glancing blow to Earth's atmosphere. New research may help experts better forecast CMEs and potentially damaging space weathers.
(Image courtesy NASA Goddard Space Flight Center.)

The overlapping bands are fueled by the rotation of the Sun's deep interior, according to observations by the research team. As the bands move within the Sun's northern and southern hemispheres, activity rises to a peak over a period of about 11 months and then begins to wane. The quasi-annual variations can be likened to regions on Earth that have two seasons, such as a rainy season and a dry season, McIntosh said.

The study, published this week in Nature Communications, can help lead to better predictions of massive geomagnetic storms in Earth's outer atmosphere that sometimes disrupt satellite operations, communications, power grids, and other technologies.
The research was funded by NASA and the National Science Foundation, which is NCAR's sponsor.

A "JET STREAM" IN THE SUN
The new study is one of a series of papers by the research team that examines the influence of the magnetic bands on several interrelated cycles of solar magnetism. In a paper last year in Astrophysical Journal, the authors characterized the approximately 11-year sunspot cycle in terms of two overlapping parallel bands of opposite magnetic polarity that slowly migrate over almost 22 years from high solar latitudes toward the equator, where they meet and terminate.

McIntosh and his co-authors detected the twisted, ring-shaped bands by drawing on a host of NASA satellites and ground-based observatories that gather information on the structure of the Sun and the nature of solar flares and coronal mass ejections (CMEs). These observations revealed the bands in the form of fluctuations in the density of magnetic fuel that rose from the solar interior through a transition region known as the tachocline and on to the surface, where they correlated with changes in flares and CMEs.
In the new paper, the authors conclude that the migrating bands produce seasonal variations in solar activity that are as strong as the more familiar 11-year counterpart. These quasi-annual variations take place separately in both the northern and southern hemispheres.

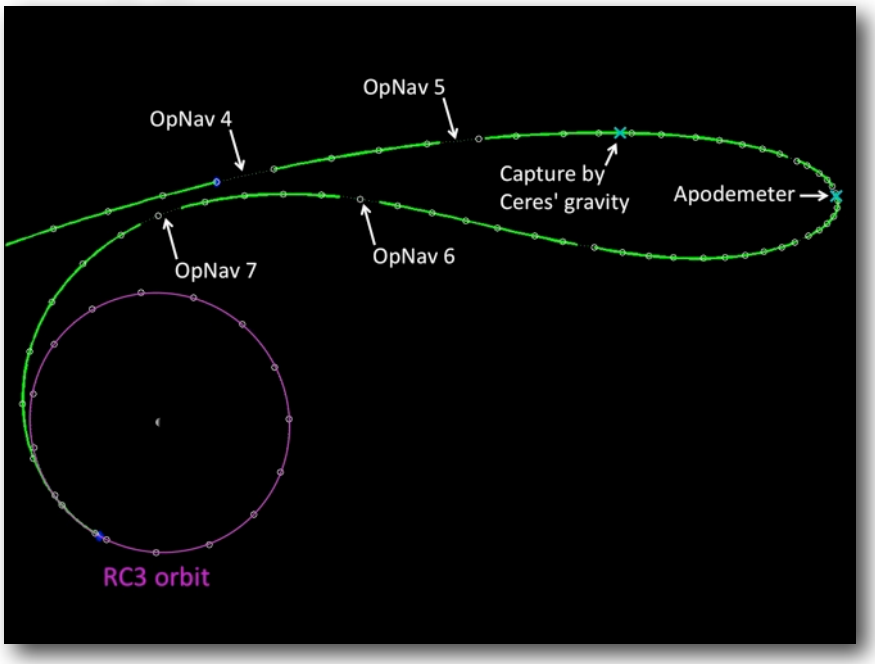
"Much like Earth's jet stream, whose warps and waves have had severe impact on our regional weather patterns in the past couple of winters, the bands on the Sun have very slow-moving waves that can expand and warp it too," said co-author Robert Leamon, a scientist at Montana State University. "Sometimes this results in magnetic fields leaking from one band to the other. In other cases, the warp drags magnetic fields from deep in the solar interior, near the tachocline, and pushes them toward the surface."
The surges of magnetic fuel from the Sun's interior catastrophically destabilize the corona, the Sun's outermost atmosphere. They are the driving force behind the most destructive solar storms.

"These surges or 'whomps' as we have dubbed them, are responsible for over 95 percent of the large flares and CMEs—the ones that are really devastating," McIntosh said.

The quasi-annual variability can also help explain a cold-war era puzzle: why do powerful solar flares and CMEs often peak a year or more after the maximum number of sunspots? This lag is known as the Gnevyshev Gap, after the Soviet scientist who first reported it in the 1940s. The answer appears to be that seasonal changes may cause an upswing in solar disturbances long after the peak in the solar cycle. Researchers can turn to advanced computer simulations and more detailed observations to learn more about the profound influence of the bands on solar activity. McIntosh said this could be assisted by a proposed network of satellites observing the Sun, much as the global networks of satellites around Earth has helped to advance terrestrial weather models since the 1960s.

"If you understand what the patterns of solar activity are telling you, you'll know whether we're in the stormy phase or the quiet phase in each hemisphere," McIntosh said. "If we can combine these pieces of information, forecast skill goes through the roof."

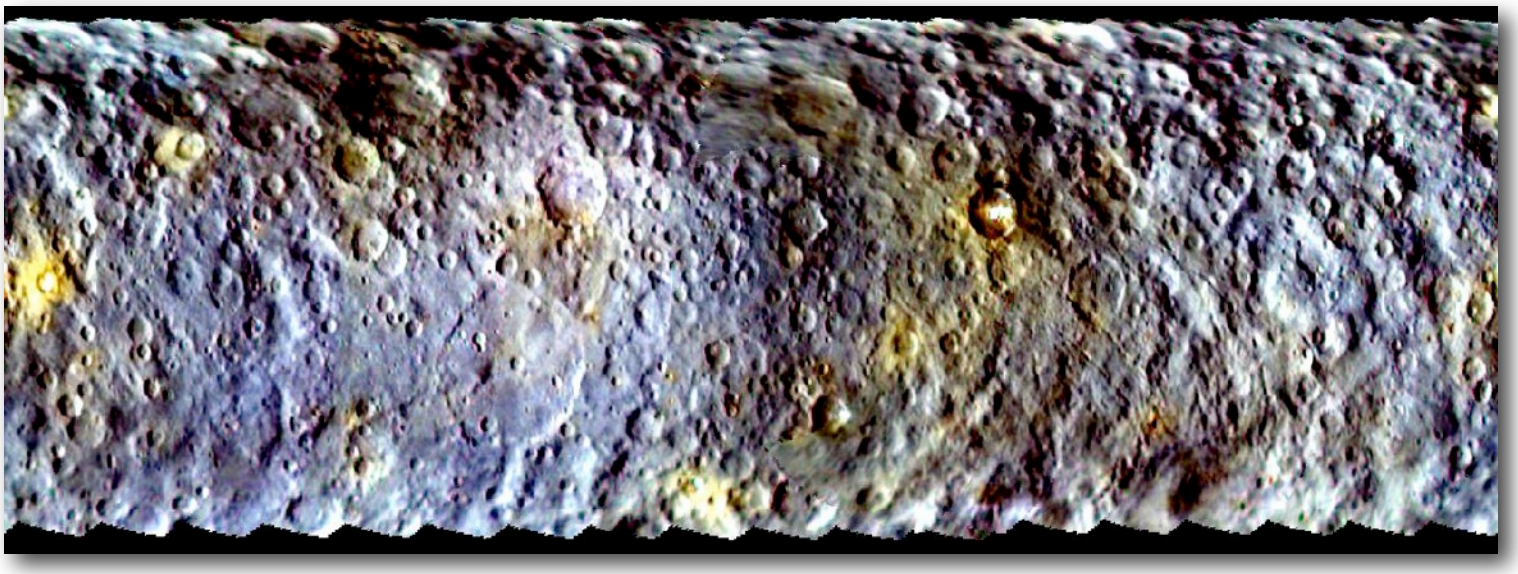
About the article
Title: The solar magnetic activity band interaction and instabilities that shape quasi-periodic variability
Authors: Scott W. McIntosh, Robert J. Leamon, Larisza D. Krista, Alan M. Title, Hugh S. Hudson, Pete Riley, Jerald W. Harder, Greg Kopp, Martin Snow, Thomas N. Woods, Justin C. Kasper, Michael L. Stevens, and Roger K. Ulrich
Publication: Nature Communications



Dawn in Orbit Around Ceres

On March 6 of this year, the Dawn spacecraft was captured by the gravity of asteroid Ceres. By the time you read these lines, Dawn will have reached a normal orbit called RC3 (Apr 23) where it will start its long-term observations. About two weeks later it transfers into an orbit three times lower (4 400 km). The lower orbits take a month or so to achieve and start on June 6 (Survey), Aug 4 (HAMO) and Dec 8 (LAMO). The craft will continue in its last orbit until the start of 2016 but if the spacecraft is healthy look for NASA to continue support at least until Dawn runs out of fuel.

First Map Shows Varied Surface



A new color map of dwarf planet Ceres, which NASA's Dawn spacecraft has been orbiting since March 6, reveals the diversity of the surface of this planetary body. Differences in morphology and color across the surface suggest Ceres was once an active body, Dawn researchers said today at the 2015 General Assembly of the European Geosciences Union in Vienna.

"This dwarf planet was not just an inert rock throughout its history. It was active, with processes that resulted in different materials in different regions." said Chris Russell, principal investigator for the Dawn mission, based at the University of California, Los Angeles.

Previously, at Vesta, Dawn studied a dry body, but Ceres is believed to be 25% water ice by mass. By comparing the two, scientists hope to gain a better understanding of the formation of the solar system.

Ceres' surface is heavily cratered, as expected, but appears to have fewer large craters than scientists anticipated. It also has a pair of very bright neighboring spots in its northern hemisphere. More detail will emerge after the spacecraft begins its first intensive science phase on April 23, from RC3 orbit, said Martin Hoffmann, investigator on the Dawn framing camera team.

The visible and infrared mapping spectrometer (VIR) examining Ceres has been recording the relative temperatures of features on its surface. Preliminary examination suggests that different bright regions on Ceres' surface behave differently, said Federico Tosi, investigator on the VIR instrument team.

Earlier, Hubble Space Telescope had identified 10 bright regions on Ceres' surface. One pair, the brightest visible marks on Ceres, appears to be located in a region that is similar in temperature to its surroundings. But a different bright feature corresponds to a region that is cooler than the rest of Ceres' surface.

The origins of Ceres' bright spots remain unknown. It appears the brightest pair is located in a crater 92 km wide. As Dawn gets closer to the surface of Ceres, better-resolution images will become available.

Both Vesta and Ceres are located in the main asteroid belt between Mars and Jupiter. The Dawn spacecraft will continue studying Ceres through June 2016.

Dawn's mission is managed by NASA's Jet Propulsion Laboratory, Pasadena, California with international partners from Germany and Italy.

For more information about Dawn, visit: http://dawn.jpl.nasa.gov

Author: Elizabeth Landau NASA's JPL, Pasadena, Calif.

Comets...Developing a Passion

by Lorraine Rodgers

After a recent discussion about comets, I was encouraged to write and share my experience in the hope that others will take up the hunt.

I sat down and compiled a list of all the comets I have searched for and seen visually since I began to seriously pursue astronomy in 2008. Starting with Comet Lulin (C/2007 N3) on a cold night in February of 2009, I came up with a list of 11 comets. Seven of those have been in the last two years. Either we've been lucky, or I've just become aware and interested.

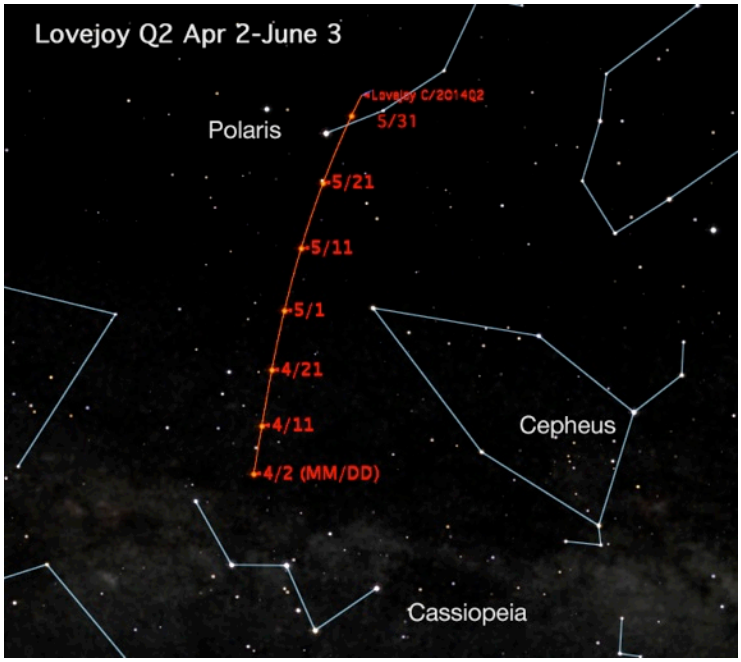
Several of these comets were easy to find, and the rest were only found after intense searching. For some, I had to keep going back, several nights(or mornings) in a row. I specifically remember that with ISON (C/2012 S1) and Lovejoy (C/2013 R1) in the fall of 2013. Then, there was the wonderful surprise of PanSTARRS (C/2011 L4) in the spring of 2013. I followed that comet for 2 months. I observed how it changed, especially its 2 tails. I enjoyed it with family, and friends, and alone, at several different locations. Several of our members shared their images of that beautiful comet. Thanks guys!

Currently, we have Lovejoy Q2 (C/2014 Q2) in the night sky. It is passing through Cassiopeia during March [and heading towards Polaris in Apr and May -ed]. We have watched this particular comet since Jan 13/15. Every chance the sky affords, I grab my binoculars and sneak a quick peak, watching its progress through the constellations.

Then there was Comet Jacques (C/2014 E2) in Cassiopeia this summer. My first sighting of it was in August 2014 at Starfest. That was especially fun, since I could share the excitement with more enthusiastic astronomers than normal. Members shared pictures of that prize too.

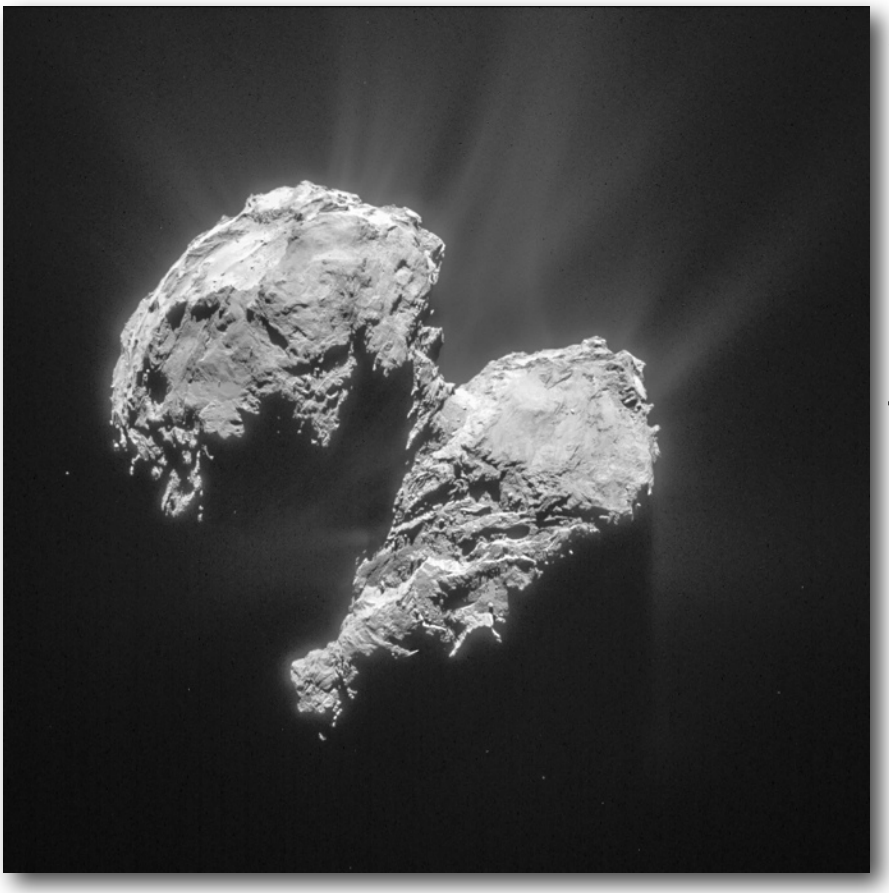
I had a hunch that most comets seem to pass through the constellation Cassiopeia. I looked through my sky journals, and with the help of the SkySafari program, I looked at 9 out of 11 of the comets I have seen. It so happened that only 5 of them had been in Cassiopeia. In actual fact, after research shared by friends, there is no scientific reason to support my hunch. At least we settled that!

Perhaps you have never actually seen a comet. My journal entry after viewing my first comet, Lulin, says " comet very fuzzy - seemed a lot like a galaxy." In binoculars comets usually look like fuzzy out-of-focus stars. In a telescope, it is a much bigger fuzz, but still a fuzz. You can't get a sharp focus on it like you can a star. The



nucleus is often bright, and is usually surrounded by larger fuzzy haze. The larger aperture telescopes can often bring out the tail(s) of a comet, making it that much more exciting. My best views of comet tails have been with the club's 28" Webster, of course.

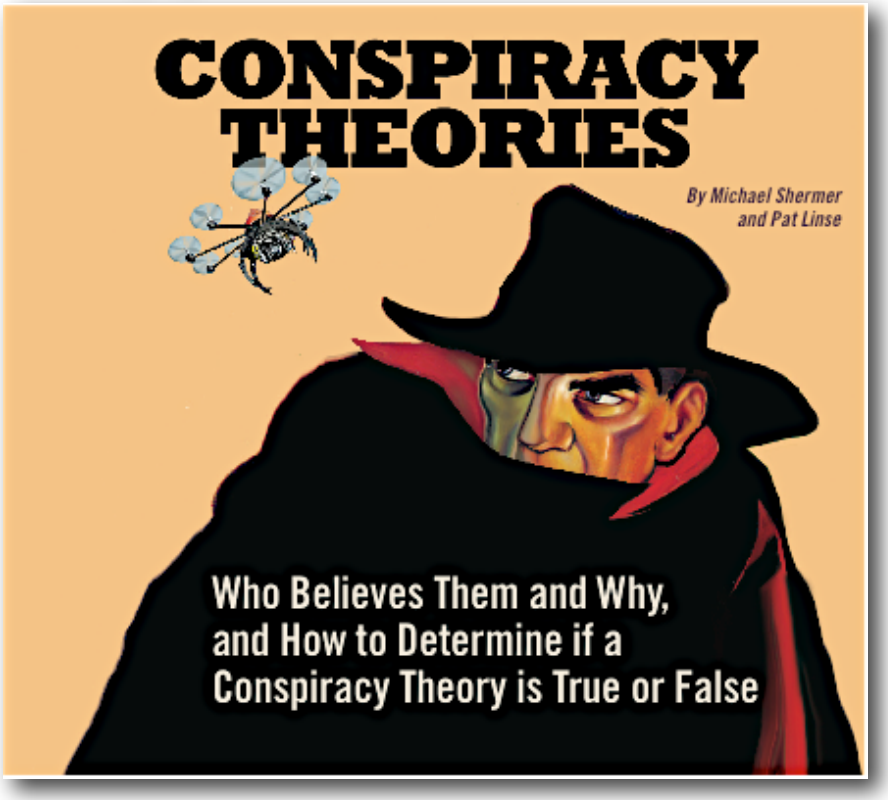
I suggest waiting until at least deep twilight to try to view a comet. The bright sky makes it very difficult. As well, doing your homework ahead of time should make a more profitable search. Finding a good chart with the locations of said comet, for each day, will make a big difference. Comets move very quickly against the background stars, especially when they are closest to the Earth. To conclude, here is my list of comets I have enjoyed. Perhaps these names will bring back memories for some of you. Or perhaps it will encourage more comet tales, for those who have been watching the sky for more years than I have. From Feb 2009 to March 2015: Lulin, McNaught, Hartley 2, Garradd, PanSTARRS, Lemmon, Lovejoy, ISON, PanSTARRS, Jacques, and Lovejoy Q2.



67/P Heating Up

ESA's Rosetta Spacecraft continues to orbit Comet 67/P and monitor activity, which appears to be increasing as expected as the comet closes in on the Sun (perihelion Aug 13). Check out the latest at http://rosetta.esa.int/

Image Left: *Comet 67/P on 22 March 2015*
This single frame Rosetta navigation camera image was taken from a distance of 77.8 km from the centre of Comet 67P/Churyumov-Gerasimenko on 22 March 2015. The image has a resolution of 6.6 m/pixel and measures 6 x 6 km. The image is cropped, and processed to bring out the details of the comet's activity. ***Credit: ESA/Rosetta***



Many years ago one of my sons said to me: "Dad, you don't believe in anything!" This was in response to my doubting some item he was relating about some strange phenomena (UFO's, Sasquatch or some such). He may have meant it more like "You're no fun" as opposed to a comment on my skepticism, but I took it as the latter. I always ignore remarks about how dull I am, especially since I am not.

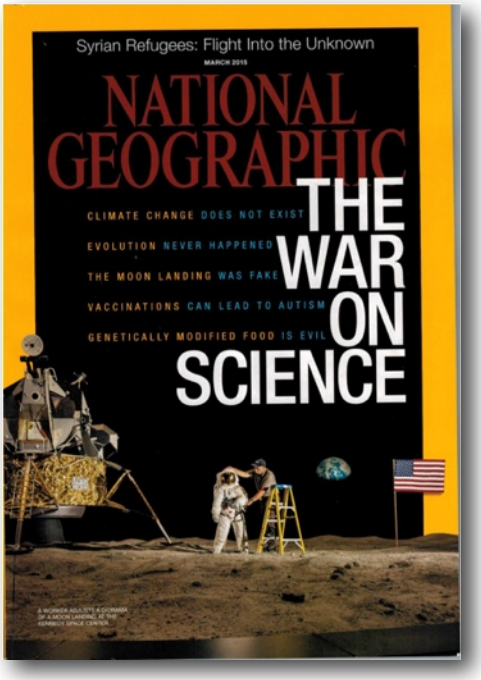
Still, I don't know why I am such a skeptic. I have always been ticked off by anyone who tries to fool me into doing or believing something ridiculous. All of us are more or less sensitive about looking stupid when the "trick" is revealed, at least when we were young people around our teenaged friends. Most of us grow of it. Not me.

So it still annoys me when I hear preposterous ideas like those you will read about in the item at left from Michael Shermer and Pat Linse of the Skeptical Society. Someone called it a "built-in doubter" and mine has been honed to a keen edge over time.

This is why The Skeptical Inquirer or its predecessor, the Committee for Claims of the Paranormal (CSICOP) resonated with me years ago when I first started reading their magazine. That group even spawned a local Toronto Ontario chapter called the Ontario Skeptics. Now there are skeptics groups in London, Ottawa, Vancouver and pretty much every major Canadian city.

The Skeptics Society in the USA does a lot of work in prompting critical thinking and publishes a wide variety of materials. Their website is the place to start if you are interested: http://www.skeptic.com/
A link to the item above is here: http://www.skeptic.com/downloads/conspiracy-theories-who-why-and-how.pdf and is interesting reading.

The March 2015 issue of National Geographic has the title article by Joel Achenbach "The War on Science" relating the verbal battles that scientists and rational folks have with those who preach non-sense like some of the conspiracy theories in Michael Shermer's article upper left. A link to the Achenbach article text is provided below. Do read!



http://ngm.nationalgeographic.com/2015/03/science-doubters/achenbach-text

And the Strangest One of Them All: "The Moon is a Hologram" *

According to an imaginative lunar observer named Crow777, the moon near full is covered by an gigantic hologram. This is to cover up the cities, etc. that "They" have secreted on the Moon in preparation for what he does not say. The ONLY evidence for this is a linear distortion that he recorded on a video of the moon that you can view here: https://www.youtube.com/watch?v=zgGJPK-upA0

In the comments section of his posting, there were several sensible suggestions explaining what he had recorded that did not require an impossibly huge secret hologram projector, an enormous power supply (also secret) and many secret missions to the Moon to build the cities, etc. Give your head a shake, Mr. Crow777...

*Not all the time, only near full moon when we could see the secret stuff on the surface that "THEY" are trying to cover up.

Leo (Leo)

α–Leonis - Regulus β–Leonis - Denebola
γ–Leonis - Algieba δ–Leonis - Zosma
ε–Leonis - Asad Australis ζ– Leonis-Aldhafera θ– Leonis - Chort
λ– Leonis - Alterf μ–Leonis - Rasalas

Leo is a zodiacal constellation lying south of Ursa Major. It is one of the most beautiful of the constellations and is easily recognized; the stars forming the head of the lion are arranged in the shape of a sickle, or reversed "?." Regulus, its brightest star, has a magnitude of 1.3 and is 19th among the 20 brightest stars in the sky. It lies almost exactly on the plane of the ecliptic and is therefore eclipsed by the sun once a year (on about August 23). τ Leonis, a double star, can be separated with binoculars. A meteor shower, the Leonids, radiates from the head of the lion every year about the 14th or 15th of November.

DOUBLE STARS

	Mag.	Sep (s)	Location	Remarks
α	1.5-8.0	177	100612	Pale Blue-White.
γ	2.3-3.5	4	101720	Yellow-Green; one of most beautiful doubles in the sky.
6	5.3-9.0	37	092910	
7	6.2-9.3	42	093315	
54	4.5-6.3	6	105325	Greenish Wh-Blue; beautiful.
88	6.2-8.2	15	112915	
90	6.0-7.3	3	113217	

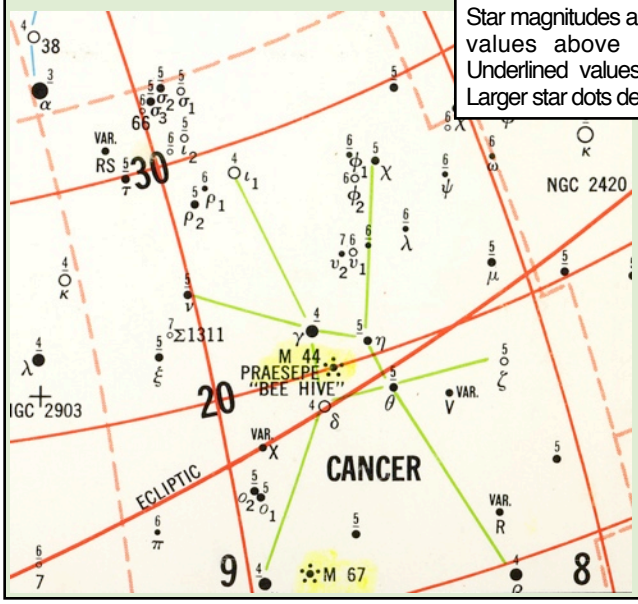
MESSIER OBJECTS

	Mag	Location	Remarks
M65	9.3	111613	Spiral Galaxy.
M66	8.4	111813	Spiral Galaxy.
M95	10.4	104112	Spiral Galaxy.
M96	9.1	104412	Spiral Galaxy.
M105	9.2	104513	Spiral Galaxy.

Other Objects in Leo

R Leonis - Long period (313 days) variable, magnitude range 5-11. This star is red in color and is visible to the naked eye at maximum. Location 094512.

The Leo Triplet Just under the rear feet of Leo are three spiral galaxies: **M65, M66 and NGC3628.** M65 and M66 are edge-on about 0.33° apart and about mag. 9. The third spiral is NGC3628, fainter but larger, and in medium scopes shows a prominent dust lane. Starry Night says: "The sight of this lovely trio is a delight under low power in telescopes. M65 is quite large and oval shaped and M66 has a noticeably bright star-like nucleus. A moderate aperture telescope begins to reveal subtle detail."



Cancer (Cnc)

Cancer is a zodiacal constellation east of Leo and directly above the head of Hydra. The stars in this constellation are of the 4th and 5th magnitudes; it is the most inconspicuous of the zodiacal constellations. Its most interesting feature is the coarse open cluster Praesepe, more often called the "Bee-Hive." It is barely visible to the naked eye, but in binoculars it is a beautiful sight. It lies just north of the ecliptic contained in the rough square formed by the stars γ, δ, η and θ-Cancri. ι-Cancri is a fieldglass double.

DOUBLE STARS

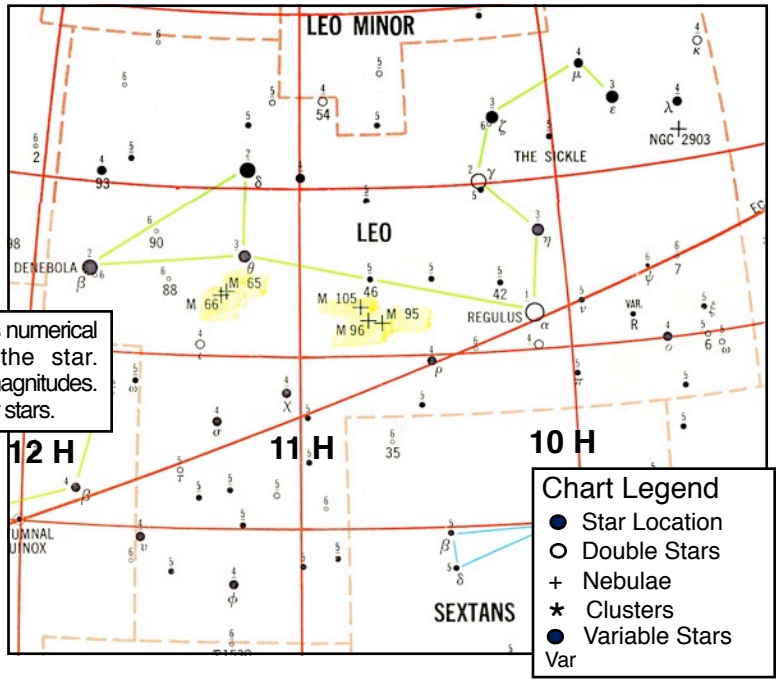
	Mag.	Sep (s)	Location	Remarks
ζ	5.7-6.0-6.3-7.8	6-0.9-0.2	081018	Quadruple; only two, 6" apart vis. in small scope. Yellow-Or.
ι1	4.2-6.6	31	084429	Yellow-Blue; fine contrast.
ν1	6.0-7.1	6	082924	
φ2	6.3-6.3	6	082427	
66	6.0-8.1	5	085932	
Σ1245	6.0-7.2	10	083307	
Σ1311	6.8-7.3	8	090423	

MESSIER OBJECTS

	Mag	Location	Remarks
M44	3.7	083720	Open Cluster. "The Beehive;" a coarse cluster 500 ly away; 358 stars to 18th mag.
M67	6.1	084912	Open Cluster. Stars of mag 9 to 12.5, surrounded by brighter stars in a semi-circle. Resembles nebula in a small scope.

Other Objects of Interest in Cancer

γ-Cancri - Frequently occulted by the moon; an interesting sight. Dates and times given in Observer's Handbook.
R-Cancri - Long period (362 d) variable; max 6.8, Location 081312.
V-Cancri - Long period (272 d) variable; max 7.9, Location 081817.



The Leo Galaxy Group The other beautiful galaxy group in Leo are spirals, **M95** and **M96** and the elliptical galaxy, **M105**. The first two are 42 min of arc apart, twice the separation of M65 and M66. The brighter is **M95** but M96 is more interesting with a bright core and hints of a bar crossing it, since it is a barred spiral. All three are fainter that the Leo Triplet, being 10.5, 11 and 11th magnitudes respectively.

Date: (Time given as 24 h clock for Eastern DST).

May 01 01:29 Mercury-Pleiades: 1.6°S
04 03:42 FM rises locally at 8:09 pm EDT
05 16:19 Saturn 2.0°S of Moon
06 09:00 **η-Aquariids** peak 60/h Moon 94% Full (bah!)
07 05:00 Mercury at Greatest Elong. E: 21.2° Best of 2015
11 10:36 LQ Moon rises locally at 2:13 am EDT
15 00:23 Moon at Perigee: 366 024 km
08:00 Uranus 0.2° N of Moon
18 04:13 NM rises locally at 6:32 am EDT
19 03:00 Mercury 6° N of Moon
20 20:06 Double shadow transit Jupiter 8:06 pm EDT (daytime)
21 15:00 Venus 8° N of Moon
22 22:00 Saturn at Opposition
24 03:00 Jupiter 5° N of Moon
25 17:19 FQ Moon rises locally at 1:03 pm EDT
26 22:12 Moon at Apogee: 404 246 km
27 22:01 Double shadow transit on Jupiter 10:01 pm EDT
29 17:27 Venus-Pollux: 3.9°S
30 17:00 Mercury at Inferior Conjunction

BAS/Astronomy Events

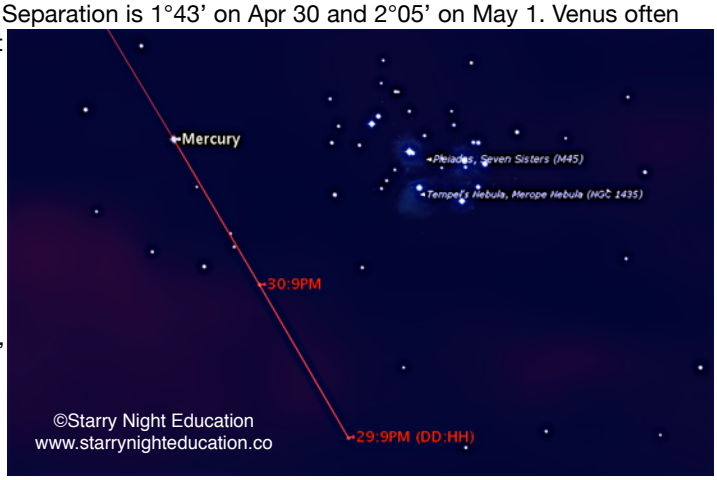
May 3 Sun FM
May 6 Wed BAS meets at Grey Roots Museum Topic/Beginners Forum
May 6 Wed **η-Aquariids meteors** peak is 9 am DST Wednesday with a possible 60/h, in daylight so observe the night before or the night after. Moon is near full and will brighten the skies.
May 11 Mon LQ
May 16 Sat BAS viewing@Fox featuring Saturn
May 17 Sun NM
May 22 Fri **Saturn at opposition** Big and bright!
May 23 Sat Star gazing with 1st OS Guides at WoL Youth Centre. Leader: John H.
May 25 Mon FQ
May 30 Sat HFBF star talk & star tour (weather permitting) contact John H. if you can help with a scope

Special Events

The planet Mercury has its best appearance in the sky for 2015 this month. It quickly moves away from the Sun reaching 21.2° east, then just as quickly moves back again. It is between the Sun and Earth on May 30. No wonder the ancients gave the god Mercury winged feet! Next month it appears as the Morning Star.

Mercury and Pleiades

If you have a clear, flat western horizon around 9 pm on Apr 30 and/or May 1, watch Mercury pass the Pleiades. Separation is 1°43' on Apr 30 and 2°05' on May 1. Venus often makes Pleiades passes, but Mercury near the Seven Sisters is a bit rarer. Diag. right shows position of Mercury on Apr 29, then on Apr 30 and finally on May 1 at about 9 pm EDT. The Pleiades are about 7° above the western horizon at that time. Last month, Venus did the run past M45, this time it is Mercury's turn but it is lower and sets earlier. Images appreciated!

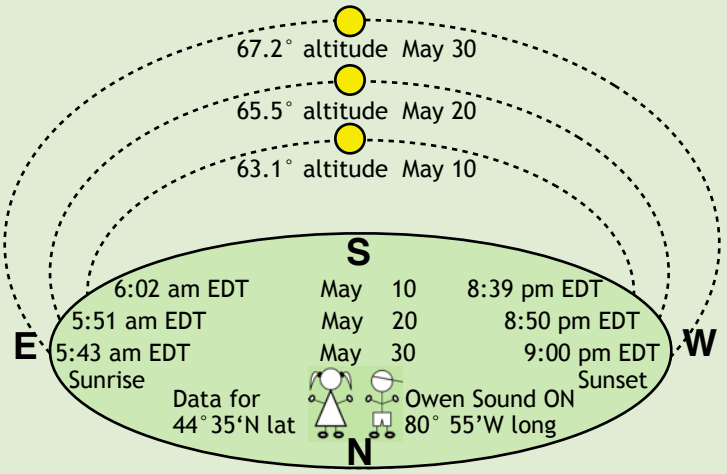


Planets

MERCURY, has its best appearance of 2015 this month reaching 21° east of the Sun but quickly drops back to the Sun by month-end. It is under 2° from the Pleiades from Apr 30 to May 1. **VENUS,** (-4.2) is well placed as the Evening Star and stays that way until autumn this year. It is less than 2° from M35 on May 9. **MARS** (mag. 1.3) is too close to the Sun this month. **JUPITER**, (-2.1) continues to be in excellent position this month. Don't pass up a view of the King of Planets and its four moons. **SATURN,** (mag. 0.1) retrogrades towards Libra in May and reaches opposition on May 22. **URANUS,** (5.8) and **NEPTUNE,** (7.8) are gradually getting out of the Sun's morning glare. By month end, Neptune rises about 2 am followed an hour later by Uranus. Similarly, both **asteroid, Vesta (7.1)** and **dwarf planet**, **Ceres (8.3)** will be better summer objects. **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 May. The Sun reaches its highest point next month on June 21.

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. Note that BAS events for May and June are listed on pg 2 but the listing at left is for May only.



May 2015

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

By permission Univ. of Texas McDonald Obs.

BAS Member Loaner Scopes

Solar H-alpha scope now out on loan.

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

One 12-inch Dob available.

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

SGN Classified Ads Section

(Now also on our website)

FOR SALE: Meade Lightbridge 16" Dobsonian

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

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

FOR SALE: Canon EOS T-adapter

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

FOR SALE: Televue Pronto

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

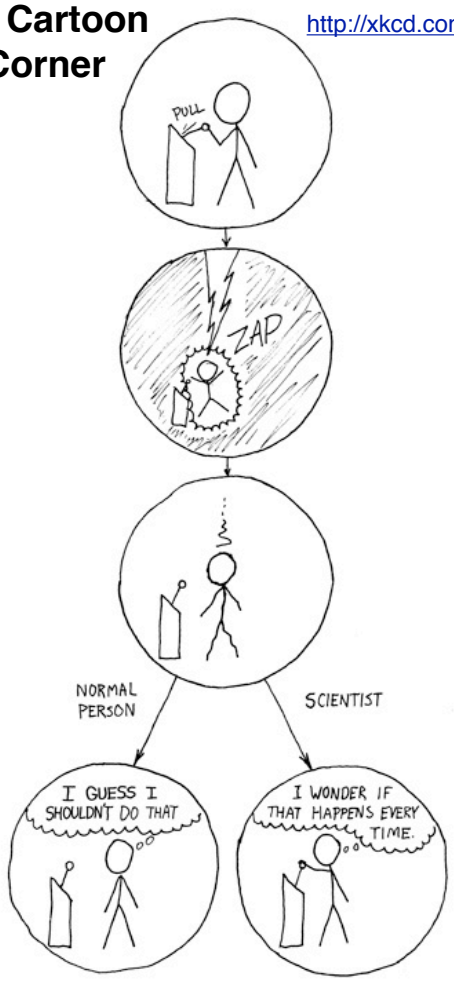
SOLD!

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



This Hubble mosaic of the spiral galaxy M83 or Southern Pinwheel, lies 15 million light-years away in the constellation Hydra. It contains thousands of star clusters, hundreds of thousands of individual stars, and "ghosts" of dead stars called supernova remnants.
Image Credit: NASA, ESA/HHT/STScI/AURA/W.Blair, JHU/R.O'Connell, UV

A photogenic and favorite target for amateur astronomers, the full beauty of nearby barred spiral galaxy M83 is unveiled in all of its glory in this Hubble Space Telescope mosaic image. The vibrant magentas and blues reveal the galaxy is ablaze with star formation. The galaxy, also known as the Southern Pinwheel, lies 15 million light-years away in the constellation Hydra.

The Hubble photograph captures thousands of star clusters, hundreds of thousands of individual stars, and “ghosts” of dead stars called supernova remnants. The galactic panorama unveils a tapestry of the drama of stellar birth and death spread across 50,000 of light years.

The newest generations of stars are forming largely in clusters on the edges of the dark spiral dust lanes. These brilliant young stellar groupings, only a few million years old, produce huge amounts of ultraviolet light that is absorbed by surrounding diffuse gas clouds, causing them to glow in pinkish hydrogen light.

Gradually, the fierce stellar winds from the youngest, most massive stars blow away the gas, revealing bright blue star clusters and giving a “Swiss Cheese” appearance to the spiral arms. These youngest star clusters are about 1 million to 10 million years old. The populations of stars up to 100 million years or older appear yellow or orange by comparison because the young blue stars have already burned out.

Interstellar “bubbles” produced by nearly 300 supernovas from massive stars have been found in this Hubble image. By studying these supernova remnants, astronomers can better understand the nature of the stars that exploded and dispersed nuclear processed chemical elements back into the galaxy, contributing to the next generation of new stars.

This image is being used to support a citizen science project titled STAR DATE: M83. The primary goal is to estimate ages for approximately 3000 star clusters. Amateur scientists will use the presence or absence of the pink hydrogen emission, the sharpness of the individual stars, and the color of the clusters to estimate ages. Participants will measure the sizes of the star clusters and any associated emission nebulae. Finally, the citizen scientists will "explore" the image, identifying a variety of objects ranging from background galaxies to supernova remnants to foreground stars.

STAR DATE: M83 is a joint collaborative effort between the Space Telescope Science Institute and Zooniverse, creators of several citizen science projects including Galaxy Zoo, Planet Hunters and the Andromeda Project (go to www.zooniverse.org to see the full list). The M83 project is scheduled to launch on Monday, January 13, 2014. People interested in exploring this remarkable image in more detail, and in directly participating in a science project, can visit: http://hubblesite.org/news/2014/04