Star Gazer News

Astronomy News for Bluewater Stargazers
Vol 10 No. 8 August 2016

August 2016 Contents

Canada's Space Agency has issued a call for applications from the general public for two additional astronauts. You must be prepared to commit a decade or so before it is likely that you get a chance to fly, but the effort is worth it. I know there are some excellent candidates among BAS members so click on the link below to get you to the application page. Deadline is Aug 16. Good luck!

https://emploisfp-psjobs.cfp-psc.gc.ca/psrs-srfp/applicant/page1800?poster=908307&toggleLanguage=en

Dark Sky Canada Day Weekend

The Dark Sky Weekend at Bruce Peninsula National Park had the best weather we have ever had, 3 nights of clear skies when we needed them. When the public gathered the clouds were absent even though there was quite a deluge Friday overnight and into Saturday mid-afternoon. Friday and Saturday night were both clear and Saturday had the best seeing and transparency I have experienced at the Park.

Below: Single 100 s image of M8, prime focus of TV 101 refractor at f/5.6, Celestron AVX mount (not auto-guided) cropped from original. Effective focal length = 934 mm.

Left to right: Lorraine Rodgers, Sue MacLaughlin, Cheryl Dawson, John Hlynialuk, Eric Ingard, Brett Tatton, Evan T. and Tyler L., two visitors from Buffalo, NY. Missing from the photo are Sandra Howe, Steve Gile, and Zoe Kestler. Tyler and Evan arrived in the parking lot for Group Site 2 Saturday afternoon and were invited to camp out with us as impromptu guests. They came up to BPNP to photograph the Milky Way and were not disappointed. They were good enough to make a donation to the BAS treasure in appreciation. Photo by Eric Ingard.

Left: M8 Lagoon Nebula: This 100 s shot of M8 was an afterthought as the crowd dwindled Saturday night. It is one of only three images I got although my intention was to try a few more MW messier objects. Our guests from Buffalo dropped by and I relinquished the telescope to Tyler to use as a foreground for his MW shots. See pg 8. Image left by John H.

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Spectacular skies at BPNP

Above: Milky Way Rising: Image by John H. at the Head of Trails parking lot during the Friday night public viewing. Canon 60Da, focal length 10 mm f/3.2 exp. 20 s. ISO 3200. The lack of crowd is due to a rather lackluster advertising effort by our park contact. The only mention of our activities was a single paragraph in the bottom corner among a list of a dozen weekend events at the park for Canada Day.

Left: North America and M31: Image by John H. at Groupsite 2. The pink nebula upper centre is the N. America Nebula (just below Deneb). The Andromeda Galaxy is also visible just to the left of the red-lit treetop. Canon 60Da, focal length 10 mm f/2.8 exp. 30 s. ISO 3200. Thanks to Brett for suggesting this shot after we finished a bottle (or two) of wine. Good things happen under the influence of the grape...

Astronomy Events: August 2016

Event times in DST with 24-h clock unless indicated otherwise

Aug	2	Tue	15:45	NM
	4	Thu	01:19	Venus 3.1° N of Moon
			17:12	Mercury 0.6° N of Moon
	5	Fri	06:57	Venus 1° N of Regulus
	5	Fri	22:28	Jupiter 0.2° N of Moon
	8	Mon	07:08	Spica 6.3° S of Moon
	9	Tue	19:05	Moon at Apogee: 404 300 km
	10	Wed	13:21	FQ
	12	Fri	07:10	Saturn 4° S of Moon
			07:26	**Perseid Meteor Shower: ZHR = 90**
	16	Tue	15:59	Mercury Greatest Elongation East: 27.4°
	18	Thu	04:27	FM
	20	Sat	00:32	Jupiter 3.8° N of Mercury
	21	Sun	20:20	Moon at Perigee: 367 000 km
	24	**Wed**	**00:09**	**Mars 1.8° N of Antares**
			20:11	**Saturn 4.3° N of Mars**
			22:41	LQ
	25	Thu	11:21	Aldebaran 0.2° S of Moon (Close miss about 2:00 pm EST)
	27	Sat	16:53	Venus-Jupiter separation 0.1° !!!
	28	Sun	15:07	Venus 5° N of Mercury

BAS Club Events: August 2016

Aug 3 Wed **REGULAR MEETING CANCELLED** (STARFEST)

4 - 7 Thu - Sun STARFEST register at http://www.nyaa.ca/

13 Sat Inverhuron Provincial Park Star gazing & Perseid Meteor Watch: Public Welcome

21 1-Yr Countdown starts to Solar Eclipse, Aug 21, 2017

26 Fri Grey Roots Public viewing (starts at dark) Public Welcome

Canadian Astronomers Discover New Dwarf Planet Beyond Neptune

by Evan Gough www.universetoday.com

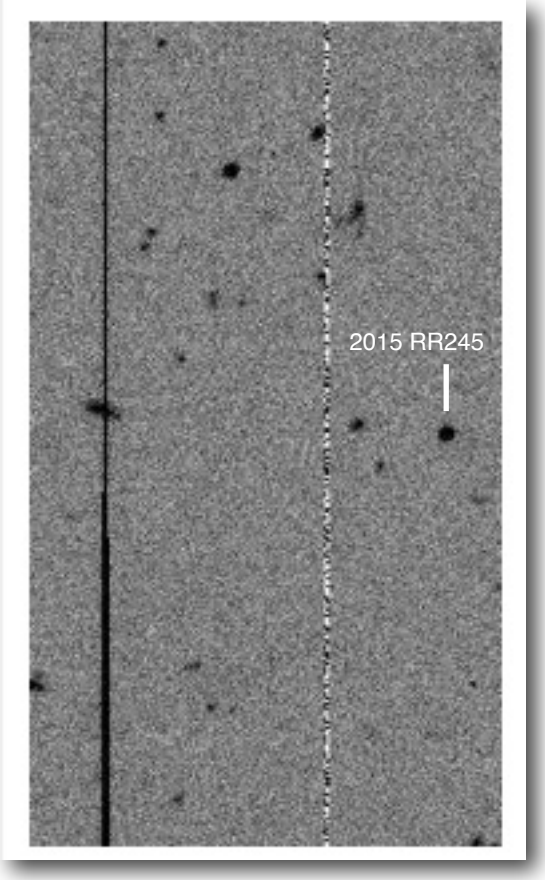
A new dwarf planet has been discovered beyond Neptune, in the disk of small icy worlds that resides there. The planet was discovered by an international team of astronomers as part of the Outer Solar Systems Origins Survey (OSSOS). The instrument that found it was the Canada-France Hawaii Telescope at Mauna Kea, Hawaii.

The planet is about 700 km in size, and has been given the name 2015 RR245. It was first sighted by Dr. JJ Kavelaars, of the National Research Council of Canada, in images taken in 2015. Dwarf planets are notoriously difficult to spot, but they're important pieces of the puzzle in tracing the evolution of our Solar System.

Dr. Michele Bannister, of the University of Victoria in British Columbia, describes the moment when the planet was discovered: "There it was on the screen— this dot of light moving so slowly that it had to be at least twice as far as Neptune from the Sun."

"The icy worlds beyond Neptune trace how the giant planets formed and then moved out from the Sun. They let us piece together the history of our Solar System. But almost all of these icy worlds are painfully small and faint: it's really exciting to find one that's large and bright enough that we can study it in detail." said Bannister.

As the New Horizons mission has shown us, these far-flung, cold bodies can have exotic features in their geological landscapes. Where once Pluto, king of the dwarf planets, was thought to be a frozen body locked in time, New Horizons revealed it to be a much more dynamic place. The same may be true of RR245, but for now, not much is known about it.



The 700 km size number is really just a guess at this point. More measurements will need to be taken of its surface properties to verify its size. "It's either small and shiny, or large and dull." said Bannister.

As our Solar System evolved, most dwarf planets like RR245 were destroyed in collisions, or else flung out into deep space by gravitational interactions as the gas giants migrated to their current positions. RR245 is one of the few that have survived. It now spends its time the same way other dwarf planets like Pluto and Eris do, among the tens of thousands of small bodies that orbit the sun beyond Neptune.

RR245 has not been observed for long, so much of what's known about its orbit will be refined by further observation. But at this point it appears to have a 700 year orbit around the Sun. And it looks like for at least the last 100 million years it has travelled its current, highly elliptical orbit. For hundreds of years, it has been further than 12 billion km (80 AU) from the Sun, but by 2096 it should come within 5 billion km (34 AU) of the Sun.

The discovery of RR 245 came as a bit of a surprise to the OSSOS team, as that's not their primary role. "OSSOS was designed to map the orbital structure of the outer Solar System to decipher its history," said Prof. Brett Gladman of the University of British Columbia in Vancouver. "While not designed to efficiently detect dwarf planets, we're delighted to have found one on such an interesting orbit".

OSSOS has discovered over 500 hundred trans-Neptunian objects, but this is the first dwarf planet it's found. "OSSOS is only possible due to the exceptional observing capabilities of the Canada-France-Hawaii Telescope (image below). CFHT is located at one of the best optical observing locations on Earth, is equipped with an enormous wide-field imager, and can quickly adapt its observing each night to new discoveries we make. This facility is truly world leading." said Gladman.

A lot of work has been done to find dwarf planets in the far reaches of our Solar System. It may be that RR 245 is the last one we find. If there are any more out there, they may have to wait until larger and more powerful telescopes become available. In the mid-2020's, the Large Synoptic Survey Telescope (LSST) will come on-line in Chile. That 'scope features a 3200 megapixel camera, and each image it captures will be the size of 40 full Moons. It'll be hard for any remaining dwarf planets to hide from that kind of imaging power.

As for RR 245's rather uninspiring name, it will have to do for a while. But as the discoverers of the new dwarf planet, the OSSOS team will get to submit their preferred name for the planet. After that, it's up the International Astronomical Union (IAU) to settle on one.

What do you think? If this is indeed the last dwarf planet to be found in our Solar System what should we call it?

First JunoCam Images from Jupiter Orbit

The JunoCam camera aboard NASA's Juno mission is operational and sending down data after the spacecraft's July 4 arrival at Jupiter. Juno's visible-light camera was turned on six days after Juno fired its main engine and placed itself into orbit around the largest planetary inhabitant of our solar system. The first high-resolution images of the gas giant Jupiter are still to come.

This color view below is made from some of the first images taken by JunoCam after achieving Jupiter orbit July 5th. The image was taken July 10, 2016 at 5:30 UTC, at 4.3 million km from Jupiter on the outbound leg of its initial 53.5-day capture orbit. The image shows atmospheric features on Jupiter, including the Great Red Spot, and moons Io (closest), Europa (right) and Ganymede (lower right). The first high-resolution images of the planet will be taken on August 27 when the Juno spacecraft makes its next close pass to Jupiter.

"This scene from JunoCam indicates it survived its first pass through Jupiter's extreme radiation environment without any degradation and is ready to take on Jupiter," said Scott Bolton, principal investigator from the Southwest Research Institute in San Antonio. "We can't wait to see the first view of Jupiter's poles."

The new view was obtained on July 10, 2016, at 1:30 p.m. EDT, when the spacecraft was 4.3 million kilometers from Jupiter on the outbound leg of its initial 53.5-day capture orbit. The color image shows atmospheric features on Jupiter, including the famous Great Red Spot, and three of the massive planet's four largest moons -- Io, Europa and Ganymede, from left to right in the image.

"JunoCam will continue to take images as we go around in this first orbit," said Candy Hansen, Juno co-investigator from the Planetary Science Institute, Tucson, Arizona. "The first high-resolution images of the planet will be taken on August 27 when Juno makes its next close pass to Jupiter."

JunoCam is a color, visible-light camera designed to capture remarkable pictures of Jupiter's poles and cloud tops. As Juno's eyes, it will provide a wide view, helping to provide context for the spacecraft's other instruments. JunoCam was included on the spacecraft specifically for purposes of public engagement.

The Juno team is currently working to place all images taken by JunoCam on the mission's website, where the public can access them.

During its mission of exploration, Juno will circle the Jovian world 37 times, soaring low over the planet's cloud tops -- as close as about 4,100 km. During these flybys, Juno will probe beneath the obscuring cloud cover of Jupiter and study its auroras to learn more about the planet's origins, structure, atmosphere and magnetosphere.

JPL manages the Juno mission for the principal investigator, Scott Bolton, of Southwest Research Institute in San Antonio. Juno is part of NASA's New Frontiers Program, which is managed at NASA's Marshall Space Flight Center in Huntsville, Alabama, for NASA's Science Mission Directorate. Lockheed Martin Space Systems, Denver, built the spacecraft.

To see a full video of Jupiter and the Galilean moons during Juno's approach to Jupiter, visit:
https://youtu.be/XpsQimYhNkA
More information on the Juno mission is available at:
http://www.nasa.gov/juno

Occator Bright Spot Probably Na_2CO_3 Deposit

The brightest area on Ceres, located in the mysterious Occator Crater, has the highest concentration of carbonate minerals ever seen outside Earth, according to a new study from scientists on NASA's Dawn mission. The study, published online in the journal Nature, is one of two new papers about the makeup of Ceres. "This is the first time we see this kind of material elsewhere in the solar system in such a large amount," said Maria Cristina De Sanctis, lead author and principal investigator of Dawn's visible and infrared mapping spectrometer. De Sanctis is based at the National Institute of Astrophysics, Rome.

At about 80 million years old, Occator is considered a young crater. It is 92 km wide, with a central pit about 10 km wide. A dome structure at the center, covered in highly reflective material, has radial and concentric fractures on and around it. De Sanctis' study finds that the dominant mineral of this bright area is sodium carbonate, a kind of salt found on Earth in hydrothermal environments [commonly called washing soda"-ed}. This material appears to have come from inside Ceres, because an impacting asteroid could not have delivered it. The upwelling of this material suggests that temperatures inside Ceres are warmer than previously believed. Impact of an asteroid on Ceres may have helped bring this material up from below, but researchers think an internal process played a role as well.

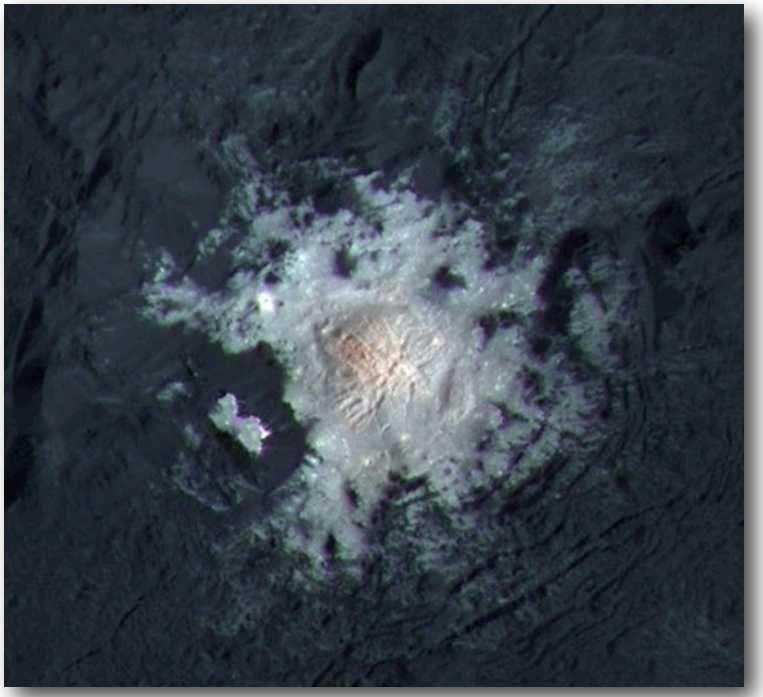
More intriguingly, the results suggest that liquid water may have existed beneath the surface of Ceres in recent geological time. The salts could be remnants of an ocean, or localized bodies of water, that reached the surface and then froze millions of years ago. "The minerals we have found at the Occator central bright area require alteration by water," De Sanctis said. "Carbonates support the idea that Ceres had interior hydrothermal activity, which pushed these materials to the surface within Occator." The new results come from the infrared mapping component, which examines Ceres in wavelengths of light too long for the eye to see.

Last year, in a Nature study, De Sanctis' team reported that the surface of Ceres contains ammoniated phyllosilicates, or clays containing ammonia. Because ammonia is abundant in the outer solar system, this finding introduced the idea that Ceres may have formed near the orbit of Neptune and migrated inward. Alternatively, Ceres may have formed closer to its current position between Mars and Jupiter, but with material accumulated from the outer solar system.

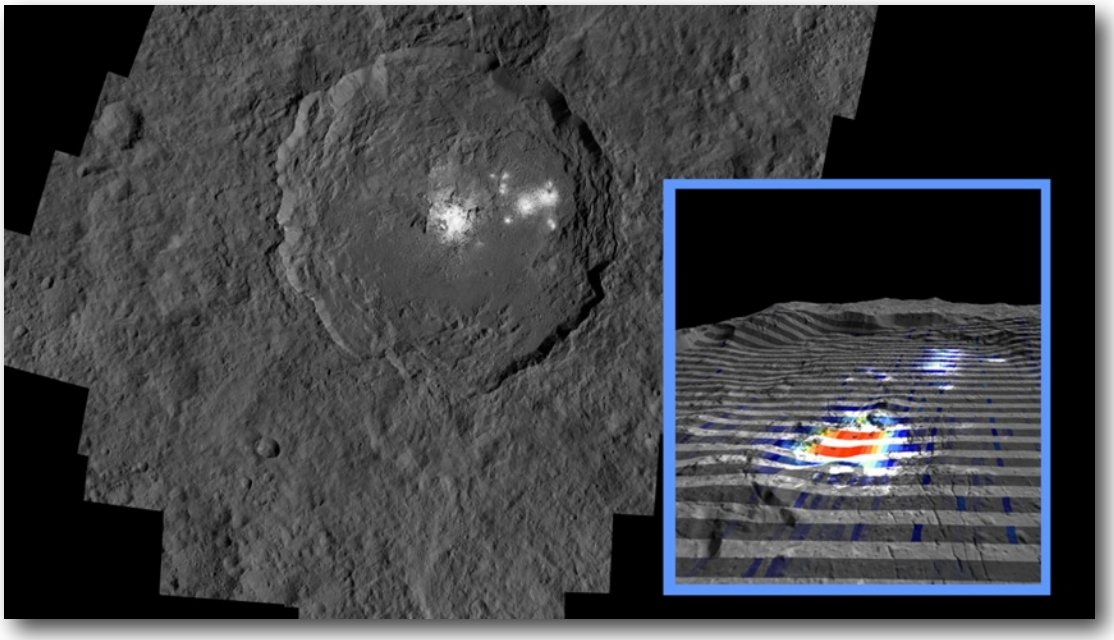
The new results also find ammonia-bearing salts -- ammonium chloride and/or ammonium bicarbonate -- in Occator Crater. The carbonate finding further reinforces Ceres' connection with icy worlds in the outer solar system. Ammonia has been detected in the plumes of Enceladus, an icy moon of Saturn known for its geysers erupting from fissures in its surface. Such materials make Ceres interesting for the study of astrobiology. "We will need to research whether Ceres' many other bright areas also contain these carbonates," De Sanctis said.

Dawn science team members have also published a new study about the makeup of the outer layer of Ceres in Nature Geoscience, based on images from Dawn's framing camera. This study, led by Michael Bland of the U.S. Geological Survey, Flagstaff, Arizona, finds that most of Ceres' largest craters are more than 2 km deep relative to surrounding terrain, meaning they have not deformed much over billions of years. These significant depths suggest that Ceres' subsurface is no more than 40 percent ice by volume, and the rest may be a mixture of rock and low-density materials such as salts or chemical compounds called clathrates. The appearance of a few shallow craters suggests that there could be variations in ice and rock content in the subsurface. More information about Dawn is available at the following sites: **http://dawn.jpl.nasa.gov** and at **http://www.nasa.gov/dawn**

Elizabeth Landau *Jet Propulsion Laboratory*



Above: Occator Crater has a central dome that is bright in the mineral sodium carbonate found in hydrothermal vents on Earth.
Image below shows infrared scans of the dome that reveal the spectral signature of sodium carbonate (red) but ammonium chloride and ammonium carbonate appear to be present as well.



Tutankhamun dagger probably meteorite iron

The spread of metallurgy in different civilizations is a keen point of interest for historians and archaeologists. It helps chart the rise and fall of different cultures. There are even names for the different ages corresponding to increasingly sophisticated metallurgical technologies: the Stone Age, the Bronze Age, and the Iron Age.

But sometimes, a piece of evidence surfaces that doesn't fit our understanding of a civilization.

Probably the most iconic ancient civilization in all of history is ancient Egypt. Its pyramids are instantly recognizable to almost anyone. When King Tutankhamun's almost intact tomb was discovered in 1922, it was a treasure trove of artifacts. And though the tomb, and King Tut, are most well-known for the golden death mask, it's another, little-known artifact that has perhaps the most intriguing story: King Tut's iron dagger. King Tut's iron-bladed dagger wasn't discovered until 1925, three years after the tomb was discovered. It was hidden in the wrappings surrounding Tut's mummy. It's mere existence was a puzzle, because King Tut reigned in 1332–1323 BC, 600 years before the Egyptians developed iron smelting technology.

It was long thought, but never proven, that the blade may be made of meteorite iron. In the past, tests have produced inconclusive results. But according to a new study led by Daniela Comelli, of the Polytechnic University of Milan, and published in the Journal of Meteoritics and Planetary Science, there is no doubt that a meteorite was the source of iron for the blade.

The scientists behind the study used a technique called x-ray fluorescence spectrometry to find the chemical composition of the blade. This technique aims x-rays at an artifact, and composition found by the spectrum of [photon energies] given off. Those results were then compared with 11 other meteorites.

In the dagger's case, the results indicated Fe plus 10.8 wt% Ni and 0.58 wt% Co. This couldn't be a coincidence, since iron meteorites are mostly made of Fe (Iron) and Ni (Nickel), with minor quantities of Co (Cobalt), P (Phosphorus), S (Sulphur), and C (Carbon). Iron found in the Earth's crust has almost no Ni content.

Testing of Egyptian artifacts is a tricky business. Egypt is highly protective of their archaeological resources. This study was possible only because of advances in portable x-ray fluorescence spectrometry, which meant the dagger didn't have to be taken to a lab and could be tested at the Egyptian Museum of Cairo.

Iron objects were rare in Egypt at that time, and were considered more valuable than gold. They were mostly decorative, probably because ancient Egyptians found iron very difficult to work. It requires a very high heat to work with, which was not possible in ancient Egypt.

Even without the ability to heat and work iron, a great deal of craftsmanship went into the blade. The dagger itself had to be hammered into shape, and it features a decorated golden handle and a rounded rock crystal knob. It's golden sheath is decorated with a jackal's head and a pattern of feathers and lilies.

Ancient Egyptians probably knew what they were working with. Whether they knew with absolute certainty that their iron meteorites came from the sky, and what that might have meant, they did value the iron. As the authors of the study say, "…our study confirms that ancient Egyptians attributed great value to meteoritic iron for the production of precious objects."

The authors go on to say, "Moreover, the high manufacturing quality of Tutankhamun's dagger blade, in comparison with other simple-shaped meteoritic iron artifacts, suggests a significant mastery of ironworking in Tutankhamun's time."

Iron dagger (34.2 cm long) was placed on the right thigh of King Tut's body. ***Credit:*** *Griffith Institute, Univ. of Oxford image*

Tutankhamun: Wonderful things from the Pharaoh's Tomb continues at the Grey Roots Museum and includes a replica of the dagger.
May 07, 2016 - October 29, 2016

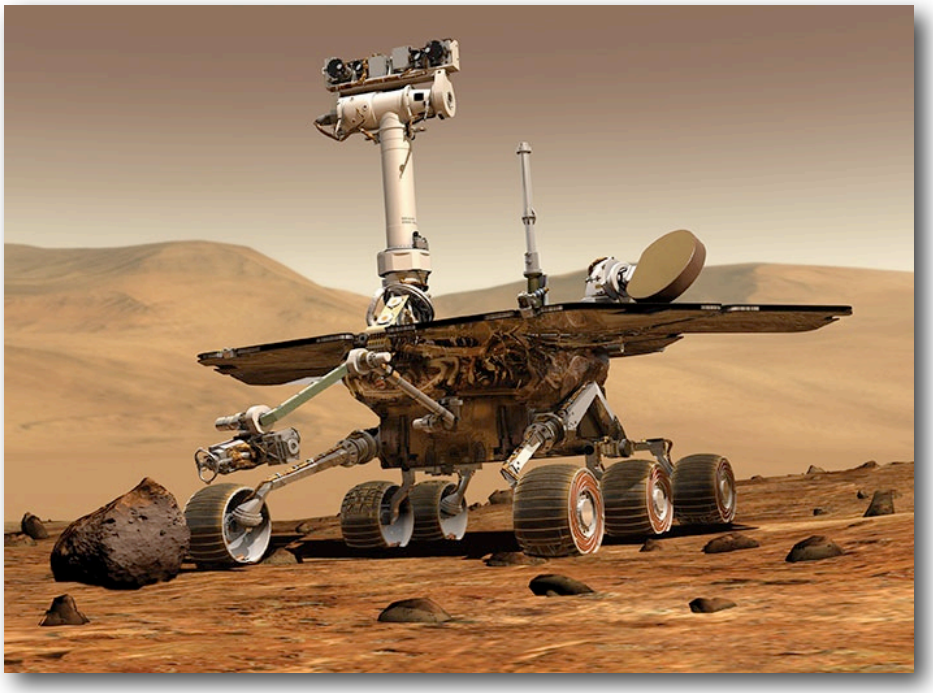
See like a solar system

Robert P Crease discusses what solar system science teaches us about perception.

Many years ago I read a news item in which a scientist said that a sodium cloud issuing from a volcano on Jupiter's moon Io was "the largest permanently visible feature in the solar system" (*Science News* **137** 359).

That remark stopped me cold. What does it mean to "see" a sodium cloud? More generally, what do scientists mean when saying they see dark matter or black holes? Are they speaking precisely or metaphorically? What is perception?

Questions like these were a big factor in attracting me to the philosophy of science. Perception, I decided, isn't as easy as it looks. To be a scientist is to develop an extended ability to perceive – and the science of the planets in our solar system is replete with examples.



How do we use instruments like a NASA Mars rover to "see" other planets? **(Courtesy: NASA/JPL)**

Seeing like a rover

When scientists say they see things like sodium clouds, they speak rigorously. To perceive is not just to grasp something somewhere from a single perspective. It is also to have a sense, however rudimentary, of how that thing looks from other perspectives. Whenever I see a cup, I see only one profile of it. But thanks to our earlier experiences with cups, to see something as a real cup – rather than as a cutout or hallucination – means to anticipate other profiles; how it'll appear if I walk around it, pick it up and so on. Sometimes these profiles surprise us, or we turn out to be deceived or wrong, but to perceive is always to grasp a profile of something and have a set of expectations about other anticipated profiles. Perception, in short, has a deep structure.

The same is true for a space scientist's perception, except that it is technologically mediated. In philosophical language, scientists sometimes "embody" their instruments, seeing the world through them relatively directly, just as a blind person sees the world through a cane. When we perceive a planet or comet through an optical telescope, for instance, our previous experiences make us expect the object to be visible at other times in other locations – and that when observed through stronger telescopes it will have profiles that we might not know but that we can guess. At other times, scientists don't embody but "interpret" their instruments. Just as we say "it's cold outside" by looking at a thermometer, so a space scientist "sees" a sodium cloud with filters and spectrometers if these belong to expected profiles.

Astronomical perception involves a complex combination of these two concepts of embodiment and interpretation. An interesting case study is found in the 2013 article "Mediating Mars: perceptual experience and scientific imaging technologies" (*Foundations Sci.* **18** 75) by the philosopher Robert Rosenberger from the Georgia Institute of Technology, US. In it, he describes a debate about a rock formation imaged by NASA's Mars Global Surveyor in a Martian crater known as Eberswalde. Some scientists argued they were looking at the remains of a river delta, others an alluvial fan, still others that they were seeing the product of mudslide-like events.

Rosenberger shows that the scientists went about resolving the controversy, not by evaluating competing theories or explanations about the rock formation itself, but by appraising the different strategies that they were using to produce the images. Without being able to move freely around the formation as they would on Earth, the scientists had to sharpen their perception of the rock formation by understanding the profiles better, and by analysing other profiles provided by shadows, laser altimeter data and so on.

Another analysis of scientific perception is found in *Seeing Like a Rover: How Robots, Teams, and Images Craft Knowledge of Mars* (2014 Princeton University Press) by the Princeton University sociologist Janet Vertesi. She based her book on two years spent as an ethnographer studying scientists in NASA's Mars Exploration Rover mission. Vertesi found the researchers' workspaces, computer screens and Powerpoints were saturated with images: filtered, false-colour, 3D, fish-eye, panoramic and more.

Taken by the two rovers Spirit and Opportunity, these images let the researchers "see" on Mars, but not with a human eye. One researcher told Vertesi that the two rovers' view of the world was like "trying to make your way through a dark cluttered room with nothing but a flashbulb". Vertesi's book shows that seeing like a rover is not just a matter of grasping profiles and horizons, but also involves "a question of seeing from *somewhere*, not adopting a view from nowhere" – with the "somewhere" referring not just to the rover's cameras but to the entire research team and its activity.

The critical point

The curse of current-day philosophy of science is the lingering but fraudulent idea among philosophers that science involves the quest to see phenomena from nowhere. Instead, it's done by people with inherited concepts using particular equipment to study topics that seem important. To perceive a scientific phenomenon involves grasping how all of the profiles you can see of it – and how others that you don't yet or never will see – hang together. Not only that, but mediated scientific perception deepens and extends our notion of what it is to perceive at all.

About the author

Robert PCrease is a professor of Philosophy, Stony Brook University, US. He is the co-author of *The Quantum Moment*

Milky Way "Bookends"

The two images on this page are what I call "Bookends". They are images of the centre of the Milky Way from two locations on the planet separated by about 67° of latitude. This is the farthest I have been able to travel to see the same object, -the MW from "opposite ends of the Earth". The image right was taken by Tyler Lekki from the national park at our Dark Sky Weekend last month (at 45.23 N, 81.52 W) and the image below was taken by Terence Dickinson from Atacama Lodge south of San Pedro de Atacama (at 22.94°S, 68.19° W) on a Sky News trip in April 2011). Both show yours truly posed with a telescope, -I wasn't actually looking at anything specific, just trying to keep from moving for 30 seconds. In the background in the Milky Way Galaxy as it appeared in the sky at the time.

Although the dates and times of the two images are different, if we consider the extra Earth rotation of this early morning shot in Chile, the views are comparable, -as if we travelled back in time to April 5, 2011. It is the identical sky but seen from two places on Earth at essentially the same time. Hence: "Bookends"! It turns out the timing was entirely coincidental, -I could never have planned a pair of shots like this. On top of that, is the fact that I could only have a set of images like this through the generosity of the photographers, Tyler Lekki, and Terence Dickinson. Thank you, gentlemen!

Northern Milky Way: Photo of MW centre by Tyler Lekki taken on July 2 just before midnight. This 30 second shot is a companion to the one below which shows the MW as viewed from the southern hemisphere (San Pedro de Atacama). Note how close the "dark horse" is to the horizon above and compare the elevation of the same feature in the image below. The "Large Sagittarius Star Cloud" is the bright glow behind the Y-shaped tree silhouette right at the horizon lower right.

Southern Milky Way: Photo of MW centre by Terrence Dickinson taken on Apr 5, 2011 at 2:46 am EST. This was a 36 second exposure (f/2.8 ISO3200 10mm (16 mm equiv.) The "dark horse" is upside down just above the brightest glow of the MW, the "Large Sagittarius Star Cloud" which is above my right shoulder. Note how far the MW extends to the right, the tadpole shaped dark patch is the Coal Sack and the Southern Cross is just to the left of that. The famous eta-Carina Nebula is just at the edge of the image upper right. Note the Large and Small Magellanic Clouds at lower right as well. Everything from the top centre of the image to the right edge of frame is not visible from Bruce Peninsula. The telescope in the foreground here is an Orion 5-inch Maksutov focal length 1600 mm on a Super Polaris mount.

A Tribute to Amateur Astronomer, Rolf Meier

" ***Linda ! I think I've got one!***" -Rolf Meier, after discovering his 4th Comet, C/1984 21on Sept 17th, 1984 (Two months after his marriage to Linda McCrae)

"***Comet hunters generally agree that the instrument is not nearly as important as the person behind it***". -Comet Hunter Don Macholz

An amateur, in any field of human endeavor, is one who engages in a hobby, or a specific pursuit, not for money, but for the sheer love of it! Nowhere is this more relevant than in amateur astronomy. How else can you understand the dedication displayed by comet hunters? The famed Australian comet hunter, William Bradfield, discovered his first comet after hunting the southern skies for almost 300 hours and he then went on to discover 17 more over the next 34 years. Observational skill, dedication, and certainly, some luck, are the essential ingredients for successful comet hunting. It's a cliché, but really, chance does favour the prepared mind, and, by using an organized search procedure and a keen eye, you might just get lucky, and a new comet will grace your telescopic field of view.

Rolf Meier, taken on the wedding day of his and Linda's son, Matthew and daughter-in-law, Melissa

By 1984, in the remarkable time span of about 6 years, one Canadian, Rolf Meier, had visually discovered 4 telescopic comets from Canadian soil,. ie (Meier C/1978 H1 on April 27th, 1978; Meier C/1979 S1 on Sept 20th, 1979; Meier C/1980 V1 on Nov 6th, 1980 and finally, Comet Meier C/1984 S1, on Sept 17th, 1984.) Indeed, looking at the above list of his discoveries and counting only from 1978 to 1980, a period of less than 3 years, Rolf had discovered 3 comets! Quite a accomplishment!

According to David Levy, Rolf became interested in comet hunting after hearing a talk at the Ottawa Centre by member Kathy Hall in 1975. His first comet discovery, (C1978 H1, image below), happened near Ottawa on April 26th 1978. He had been searching the northern skies from the RASC's Ottawa Centre's Indian River Observatory using the Centre's 16 inch (40 cm) reflector. Finally, after only 50 hours of diligent visual searching, he swept up comet C1978 H1. It was at that time that I heard about Rolf Meier.

Rolf Meier : (1953–2016)

This particular comet, C1978 H1, was the largest comet discovered at the time. Because it never came closer to the Sun than 1.14 astronomical units it never reached naked eye visibility, but it was still a wonderful discovery. It was the first telescopic comet discovery from a Canadian location. For this discovery, plus his skill at building telescopes (one was a Stellafane award winner), and his service to the Ottawa Centre and the National Council, Rolf was awarded the RASC's Chant Medal on May 20th, 1979, during the General Assembly in London Ontario. In part, the award citation reads:

"***Rolf Meier has been one of the Ottawa Centre's most dedicated and skillful observers, being present at the observatory nearly every clear night. He is an expert astrophotographer, both in colour and black and white, his astrophotographs excite admiration whenever they are shown. His search for a new comet was successful with Comet Meier, C/1978 H1. This is the first confirmed discovery of a comet from a Canadian location. It must be emphasized that this comet discovery was not accidental, but the result of a well-organized and thoroughly carried out observational programme***."

Rolf Meier's First Comet, Comet Meier, C1978 H1 located 3 AU from the Sun. Image by Rolf Meier

There is a nice romantic story associated with Rolf's 4th comet discovery. Famed comet discoverer, David Levy, who was Rolf and Linda's best man at their wedding, recounts this story in his Sky and Telescope's testimonial to Rolf. It bears repeating here:

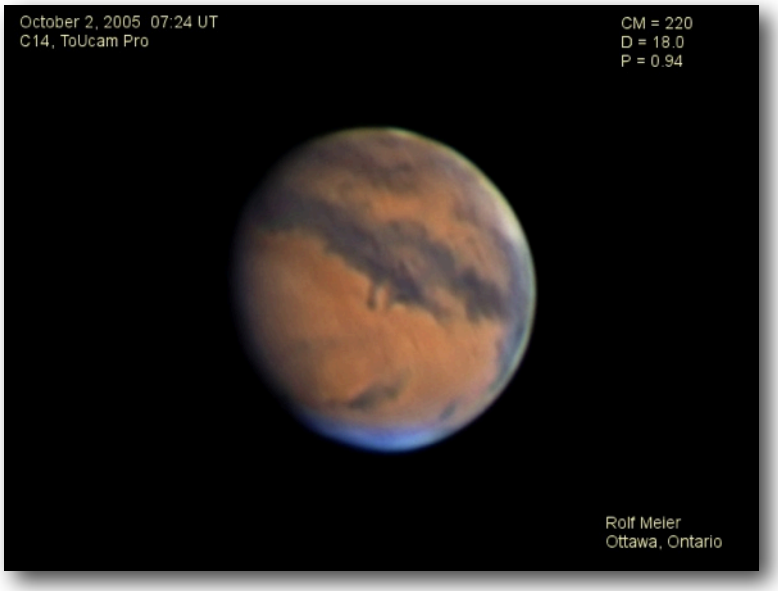
> ***"In 1984 Linda gave Rolf an oil painting. But, in return she asked him to give her another new comet. (he had already discovered 3 comets) Two months after tying the knot, in the summer of 1984, Rolf obliged. "My Linda!" Rolf would call loudly across the observing field. "My Rolfi!" Linda would respond. But then, urgently, came a second call; "Linda! I think I've got one***."
>
> From: David Levy 's Testimonial to Rolf Meier

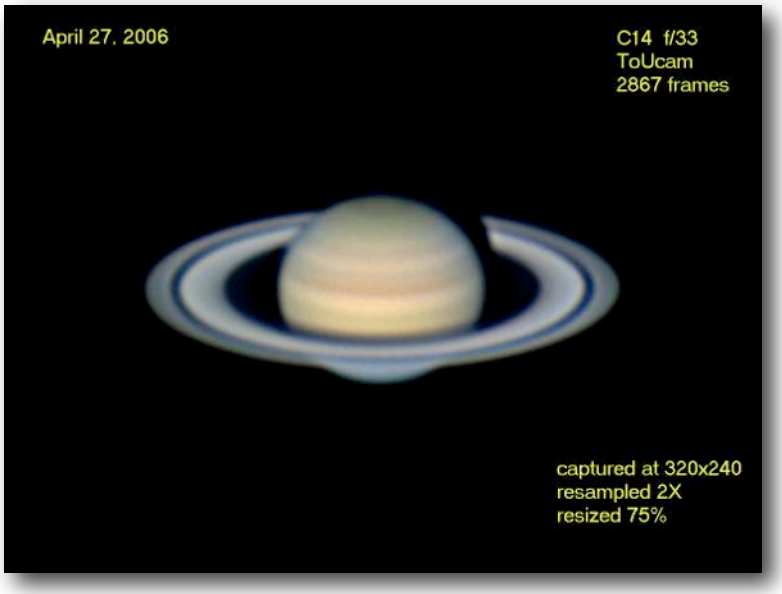
When Comet C/1984 S1 was discovered on that September night, Linda got her present of a new comet, and her husband, Rolf, became North America's leading, living, comet hunter… until David Levy surpassed him in 1989. It was to be Rolf's last comet discovery; his serious astronomical interests now took another turn…. into astrophotography.

Rolf with his wife, Linda, at Whitewater Draw in SE Arizona

Rolf had always been fascinated by the planet Mars. He would image, sketch, and paint the planet. His images captured detailed Martian features, such as Syrtis Major, Mare Cimmerium, and the Northern Polar cap. Transient Martian features, such as orographic clouds over the Tharsis volcanoes, or clouds forming within the Hellas basin, or the obscuring Martian dust storms fascinated him. Rolf regularly presented his animations, and scientific interpretations of his planetary images in talks given at the Ottawa Centre meetings of the RASC. A number of his talks, captured as U-tube videos, can be viewed at the website:

http://ottawa-rasc.ca/wiki/index.php?title=RASC_Ottawa_Centre,_Rolf_Meier



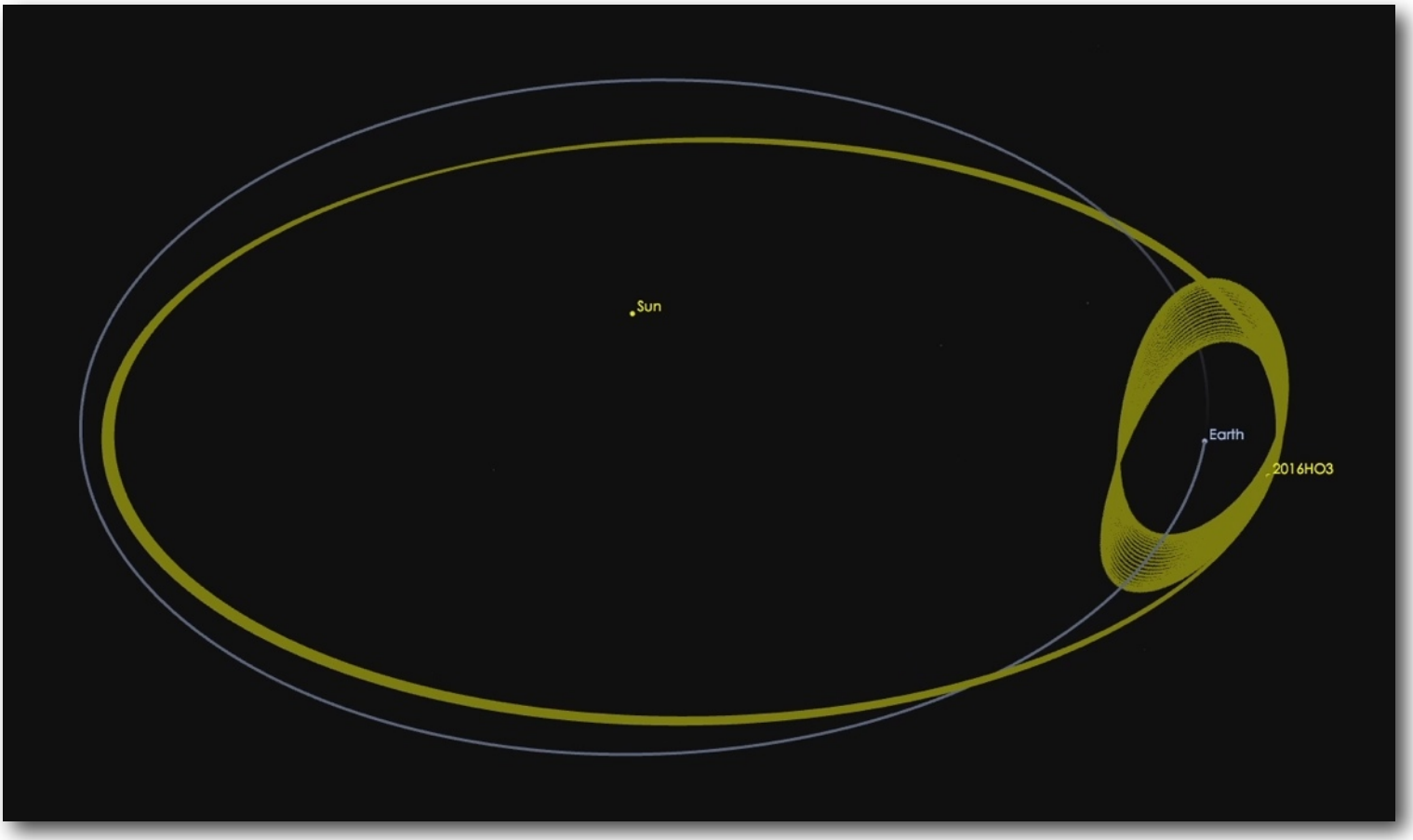


Two of Meier's excellent planetary images (Mars andSaturn), taken and processed in 2005 and 2006 with a Toucan webcam and C-14 telescope.

In late winter, 2016, Rolf Meier was diagnosed with brain cancer, a stage 4 glioma. It was with great sadness that my wife, Paula, and I learned of his passing on June 26th, 2016. Rolf was married to Linda McCrae and they have a son, Matthew, and daughter-in-law, Melissa. Rolf graduated from Carleton University in Electrical Engineering and he held many patents for his computer chip designs. Rolf lived his life to the full. He enjoyed his family time, hiking, photography, working outdoors, building observatories, repairing mechanical things and, of course, his life in astronomy. He inspired others and was always available to help them with their challenging astronomy projects, such as processing planetary video images.

Paula and I met Rolf and his wife, Linda, during one of their visits to Arizona Sky Village (ASV), in SE Arizona. In the short time that Paula and I had known Rolf and Linda, we enjoyed our trips and meals with them, appreciated Rolf's keen and dry wit, shared his astronomy interests, and enjoyed our hikes together in the Chiricahua mountains, near Portal, Arizona. With Rolf's passing his family has lost a husband and a father, the astronomy community has lost a keen amateur, Paula and I have lost a wonderful friend, and ASV will not be the same. Rolf will be missed by all who knew him!

Small asteroid is Earth's Constant Companion



A small asteroid has been discovered in an orbit around the sun that keeps it as a constant companion of Earth, and it will remain so for centuries to come.

As it orbits the sun, this new asteroid, designated 2016 HO3, appears to circle around Earth as well. It is too distant to be considered a true satellite of our planet, but it is the best and most stable example to date of a near-Earth companion, or "quasi-satellite."

"Since 2016 HO3 loops around our planet, but never ventures very far away as we both go around the sun, we refer to it as a quasi-satellite of Earth," said Paul Chodas, manager of NASA's Center for Near-Earth Object (NEO) Studies at the Jet Propulsion Laboratory in Pasadena, California. "One other asteroid -- 2003 YN107 -- followed a similar orbital pattern for a while over 10 years ago, but it has since departed our vicinity. This new asteroid is much more locked onto us. Our calculations indicate 2016 HO3 has been a stable quasi-satellite of Earth for almost a century, and it will continue to follow this pattern as Earth's companion for centuries to come."

In its yearly trek around the sun, asteroid 2016 HO3 spends about half of the time closer to the sun than Earth and passes ahead of our planet, and about half of the time farther away, causing it to fall behind. Its orbit is also tilted a little, causing it to bob up and then down once each year through Earth's orbital plane. In effect, this small asteroid is caught in a game of leap frog with Earth that will last for hundreds of years.

The asteroid's orbit also undergoes a slow, back-and-forth twist over multiple decades. "The asteroid's loops around Earth drift a little ahead or behind from year to year, but when they drift too far forward or backward, Earth's gravity is just strong enough to reverse the drift and hold onto the asteroid so that it never wanders farther away than about 100 times the distance of the moon," said Chodas. "The same effect also prevents the asteroid from approaching much closer than about 38 times the distance of the moon. In effect, this small asteroid is caught in a little dance with Earth."

Asteroid 2016 HO3 was first spotted on April 27, 2016, by the Pan-STARRS 1 asteroid survey telescope on Haleakala, Hawaii, operated by the University of Hawaii's Institute for Astronomy and funded by NASA's Planetary Defense Coordination Office. The size of this object has not yet been firmly established, but it is likely larger than 40 meters and smaller than 100 meters.

The Center for NEO Studies website has a complete list of recent and upcoming close approaches, as well as all other data on the orbits of known NEOs, so scientists and members of the media and public can track information on known objects.

For asteroid news and updates, follow AsteroidWatch on Twitter: http://www.twitter.com/AsteroidWatch

Article from NASA JPL
Diagram c/o NASA/JPL/Caltech

Cygnus (Cyg)

β Cygni - Albireo
ε Cygni-Gienah
α Cygni - Deneb
γ Cygni - Sadr
π Cygni - Azelfafage

Cygnus is a beautiful, easily recognized constellation in the form of a giant cross; it is sometimes called the Northern Cross. Deneb, a brilliant white star of magnitude 1.3 (18th of the 20 brightest stars), marks the top of the cross. There are many bright stars in Cygnus; it lies directly in the Galactic Plane and is therefore embedded in the Milky Way. Sweep this entire area with binoculars and note the many stars and clusters. The triangle outlined by α, γ and ε Cygni encloses the region known as the "[Northern] Coal Sack," a dark area in the Milky Way caused by an obscuring cloud of cosmic dust with no nearby stars to illuminate it. 61 Cygni, a double star, is the first star whose distance was measured.

DOUBLE STARS

	Mag.	Sep'n (s)	Location	Remarks
β	3.1-5.1	35	192928	Gold-Blue; beautiful contrast; one of the finest doubles.
δ	2.9-6.4	2	194445	Pale Green-Ashen
μ	4.7-6.1 -11.5-6.2	1-50-200	214228	Quadruple
o2	3.7-6.5 -5.0	107-337	201247	Yellow-Blue-Blue; triple.
τ	3.9-6.3	0.8	211338	
ψ	4.9-7.4	3	195552	White-Lilac.
16	6.3-6.4	38	194151	
17	5.0-10.5	26	194534	Red-Blue; fine field low power.
26	5.3-9.3	41	200050	Yellow-Blue.
52	4.3-9.2	6	204431	Yellow-Blue.
59	4.9-9.3	20	205947	
61	5.5-6.4	26	210538	First to have distance meas.

MESSIER OBJECTS (Cyg)

	Mag	Location	Remarks
M 29	7.1	202238	Open Cluster.
M 39	5.2	213048	Open Cluster.

MESSIER OBJECTS (Lyr)

	Mag	Location	Remarks
M 56	-	191530	Globular Cluster.
M 57	9.3	185233	Planetary Nebula. The famous "Ring Nebula"; resembles a perfect smoke ring with 15th magnitude star at center. The annular shape is visible in larger telescopes; in a small telescope it appears as a faint misty patch.

Other Objects of Interest in Lyra

R Lyrae - An irregular variable, mag range 4.0-4.5. Location 185344.

W Lyrae - Long period (196 d) var. max mag 7.9. Location 181337.

RR Lyrae - A very rapidly pulsating variable (period 0.567 days) that is the prototype of this class of variables. Magnitude range 6.9-8.0. Location 192443.

Lyra (Lyr)

α Lyrae - Vega
γ Lyrae - Sulafat
β Lyrae - Sheliak

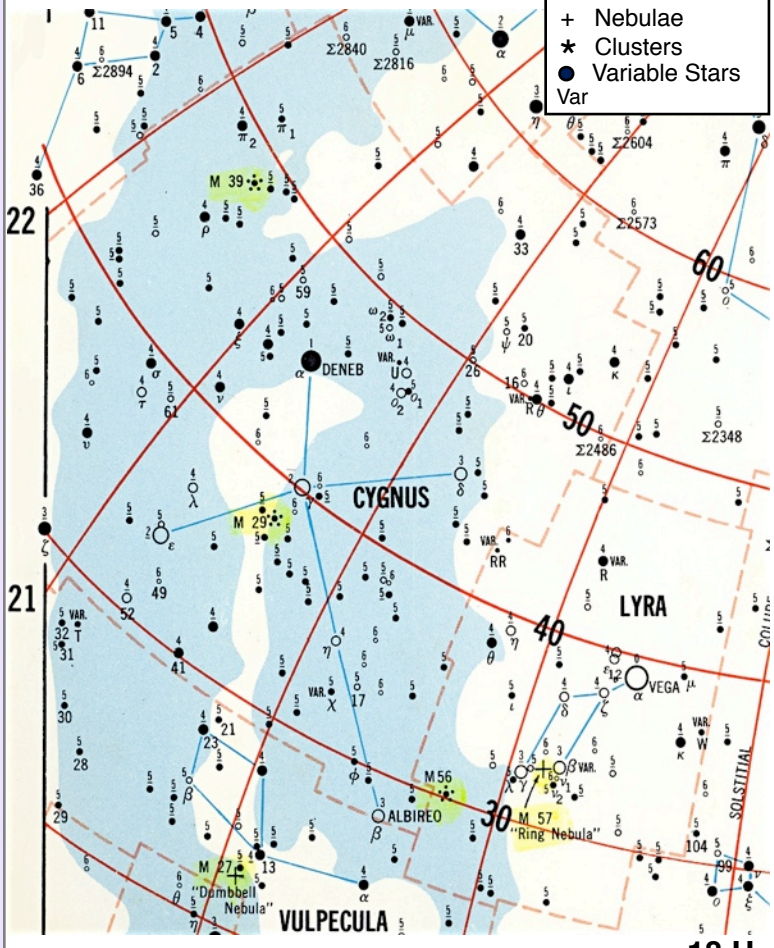
Lyra is easily identified because of Vega, a brilliant white star of magnitude 0.1, the fourth brightest star in the sky and the second brightest visible from northern latitudes. Four smaller stars lie in a faint but conspicuous parallelogram just to the southeast of Vega. Although a small constellation, Lyra is rich in stars; sweep slowly with binoculars, particularly the area between β and γ-Lyrae. Do not fail to observe β-Lyrae, an eclipsing binary whose light changes are visible to the naked eye, the magnitude varying from 3.4 to 4.3. ε-Lyrae is the famous "double-double"; persons with very keen eyesight can see the two components. They are easily split with binoculars. In a telescope, each of the components itself becomes a double.

DOUBLE STARS

	Mag.	Sep (s)	Location	Remarks
α	0.1-10.5	56	183539	Bluish White-Orange.
β	3.0-6.7- 9.2-9.8	46-67 -86	184933	Quadruple.
ε	4.2-5.5	150	184340	ε1, 5.1-6.0, 3", Pale Green-Pale Blue; ε2, 5.1-5.4, 2", Both Wh.
ζ	4.3-5.7	44	184338	Topaz-Green; beautiful contrast.
η	4.5-8.0	28	191239	

Magnitude values are near the star.
Underlined values are half magnitudes.

Chart Legend
- Star Location
- Double Stars
- Nebulae
- Clusters
- Variable Stars



Aug	2	Tue	15:45	NM rises locally at 6:00 am DST
	4	Thu	01:19	Venus 3.1° N of Moon
			17:12	Mercury 0.6° N of Moon
	5	Fri	06:57	Venus 1° N of Regulus
			22:28	Jupiter 0.2° N of Moon
	8	Mon	07:08	Spica 6.3° S of Moon
	9	Tue	19:05	Moon at Apogee: 404 300 km
	10	Wed	13:21	FQ rises locally at 2:06 pm DST
	12	Fri	07:10	Saturn 4° S of Moon
			07:26	**Perseid Meteor Shower: ZHR = 90**
	16	Tue	15:59	Mercury Greatest Elongation East: 27.4°
	18	Thu	04:27	FM rises locally at 8:35 pm EDT
	20	Sat	00:32	Jupiter 3.8° N of Mercury
	21	Sun	20:20	Moon at Perigee: 367 000 km
	24	Wed	00:09	**Mars 1.8° N of Antares**
			20:11	**Saturn 4.3° N of Mars**
			22:41	LQ rises locally 12:12 am Aug 25
	25	Thu	11:21	Aldebaran 0.2° S of Moon (Close miss about 2:00 pm EST)
	27	Sat	16:53	Venus-Jupiter separation 0.1° !!!
	28	Sun	15:07	Venus 5° N of Mercury

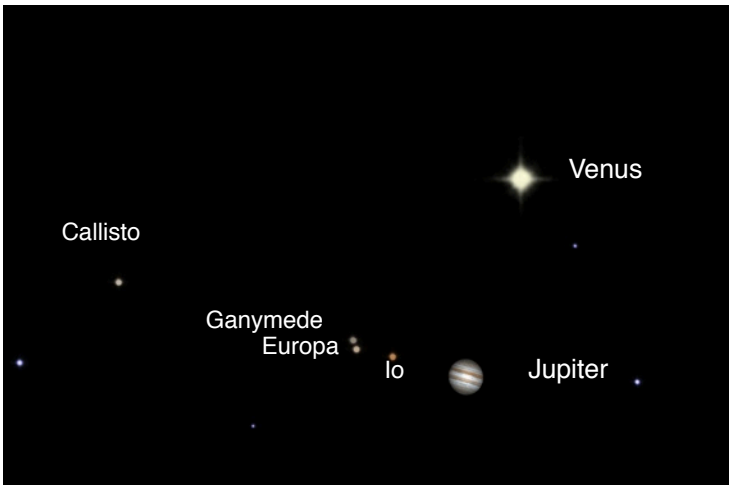
BAS Events

Aug 3	Wed	**REGULAR MEETING CANCELLED** (STARFEST)
4 - 7	Thu - Sun	STARFEST register at http://www.nyaa.ca/
13	Sat	Inverhuron Provincial Park Star gazing and Perseid Meteor Shower night: Public Welcome
21		**1-Yr Countdown starts to Solar Eclipse**, Aug 21, 2017
26	Fri	Grey Roots Public viewing (starts at dark) Public Welcome

Special Events

Venus-Jupiter Closest Ever!

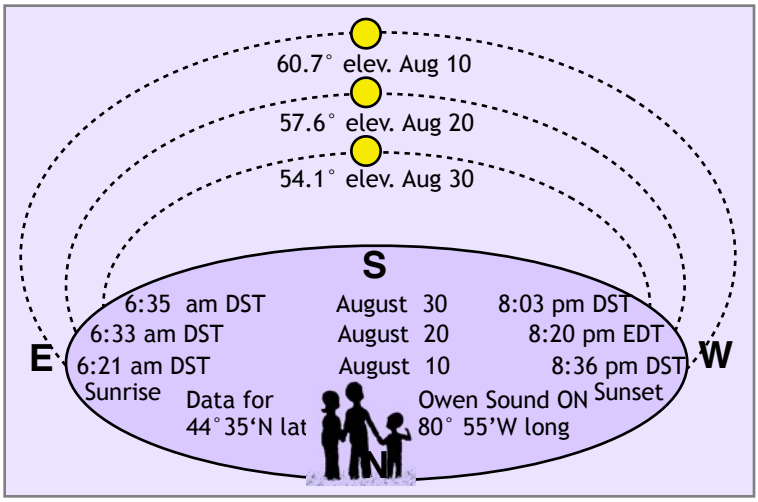
Make sure you get your telescopes out Aug 27! This extremely rare close pass of two planets may be a once-in-a-lifetime opportunity. The minimum separation occurs in daylight at 6:30 pm DST and is a very tiny 3 min 56 seconds (acc. to SN 6) from 6:34 pm to 6:36 pm or so. That is half the distance of the moon Callisto from Jupiter's centre at that time! None of the moons will be visible since it is still daylight and by sunset at 8:08 pm DST the two planets are about 9° from the western horizon. At 8:40 pm when it is darker, they are only 3° above. If luck holds, they may be seen right to the horizon with Jupiter setting at 9:00 pm and Venus about 30 seconds later. This may be a chance to get a Venus Green Flash as well as a Jupiter Green Flash! Don't miss the opportunity!



Planets

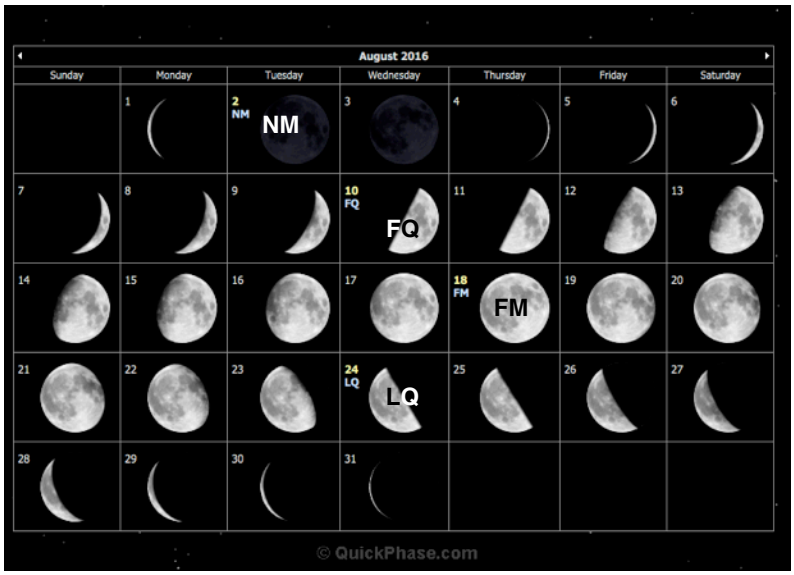
MERCURY is an evening planet now but hugs the horizon after sunset making it difficult to see. It is not a good month for Mercury viewing. **VENUS,** (-3.9) is similarly low in the west at sunset but has a very close pass to Jupiter on Aug 27 in twilight. See Special Events. **MARS,** is mag. -0.4 at month-end, tracks eastward across the head of Scorpius and slips between Antares and Saturn on Aug 23/24. **JUPITER**, (-1.7) is low in the SW at sunset and sets before 9 pm. Jupiter watching after sunset is quickly drawing to a close. **SATURN,** (mag. 0.5) is still good viewing this month and its rings are nicely tilted and enclose the entire planet. Both Mars and Saturn set before midnight in the SW but are well placed for viewing although the pair is only 20° high and not in steady air. **URANUS,** (5.8) and **NEPTUNE,** (7.9) are rising now before 9 pm and high on the meridian by midnight. **Dwarf planet**, **Ceres** (8.2) rises an hour after Uranus. **Asteroid, Vesta** (6.7) is in the club of Orion and rises by 4 am. **PLUTO** (mag. 14) is just above the handle of Sagittarius and is visible in dark sky all August. Charts for these planets/asteroids for 2016 are now on the BAS website.

The diagram below gives the sunrise/sunset times and the Sun's altitude for August. The Sun continues to lower its elevation in the sky all month. 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 listed in the Sky Calendar at left.



Moon Phase Chart for August 2016

created with QuickPhase Pro 4.0



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 to 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.

S G N Classified Ads Section

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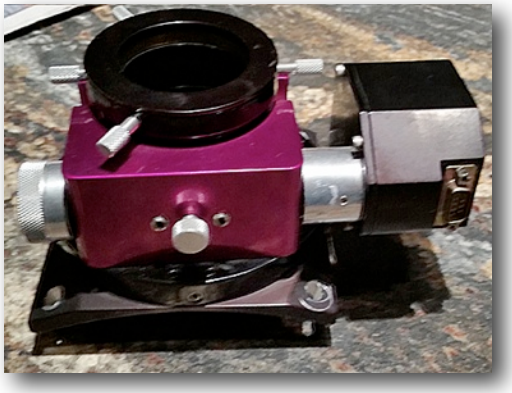

FOR SALE: Moonlite CRL 2.5 inch Large Format **Crayford Newtonian Focuser** ($592.10 new -see https://focuser.com/products.php) with Hi-Res Stepper Motor ($252.81 new). Flange for 14" tube, accepts 2" accessories (EP/camera). This is a **true Crayford focuser**, not the cheap "Crayford-style" knock-off. Not set up for manual focusing, requires hand paddle ($330 not included) for manual operation and computer control for remote focusing. This is meant for a remote imaging setup and comes from an abandoned project (12" scope). Over $850 plus taxes and shipping new.
Asking $600.00. Contact **Paul** at ski@bmts.com