PeGASus

Newsletter of the

Royal Astronomical Society of Canada: Prince George Centre

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October2008

Our pursuits are out of this world.
Our activities are astronomical.
Our aim is the sky.

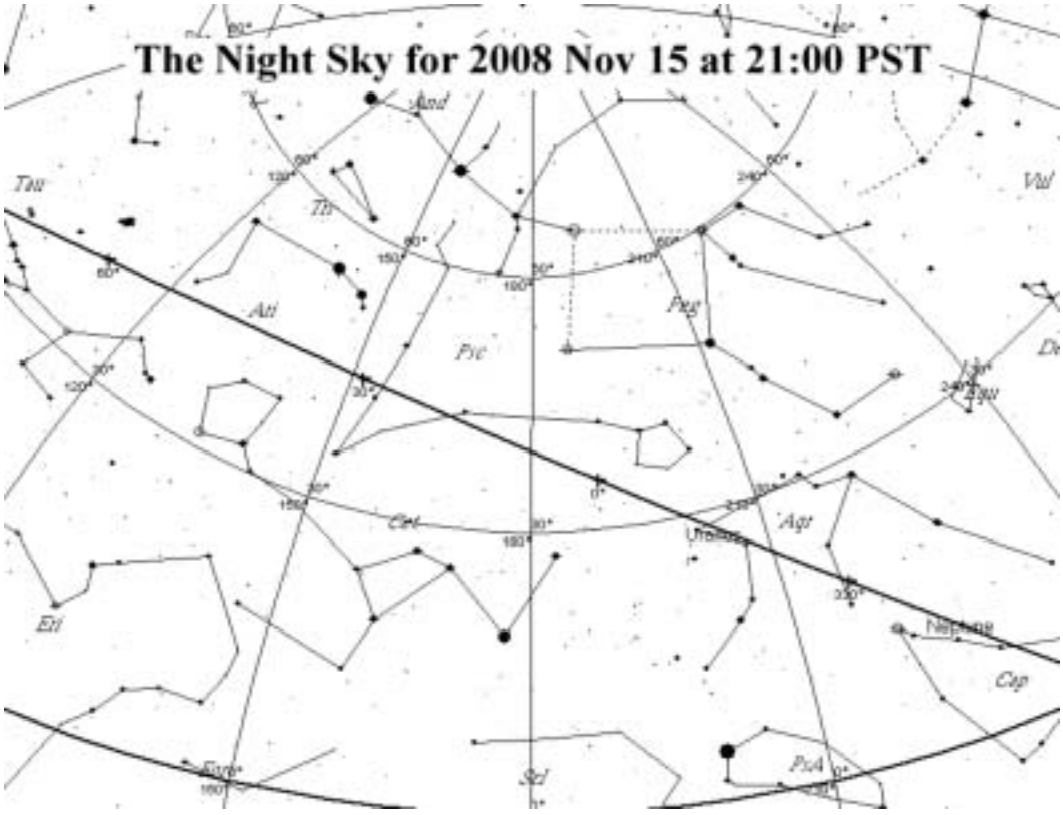
PeGASus

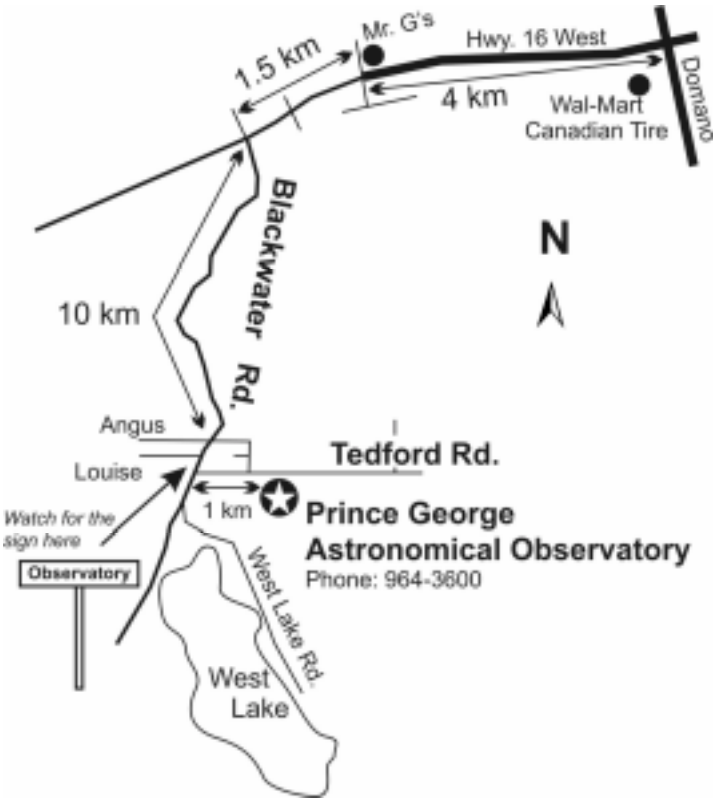
Newsletter of the
The Prince George Astronomical Society

In Issue # 169

Annual General Meeting Notice!
Saturday. October 25, 2008
7:30 pm @ Observatory

The RASC: Prince George Centre meets next,
Saturday October 25, 7:30 pm
at the Observatory for a Social Evening





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Brian Battersby

Contributions to the newsletter are welcome.

Deadline for the next issue is
November 21, 2008

PeGASus Editor
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Coming Events

To Volunteer to help run an event please contact Brian Battersby.
brianbattersby73@yahoo.ca
Phone: 561-8138 (day) 612-4623 (evening)

Date	*Event*	*Time*	*Place*	*Volunteers*
Oct. 24	Open House	7:30 pm	Observatory	*HELP*
Oct. 25	**AGM: Election of Officers**	**7:30 pm**	**Observatory**	**Gil S, *everyone!***
Oct. 25	Asteroid Occultation Timing	9:00 pm	Observatory	Wayne S
Oct. 30	Tour	7:30 pm	Observatory	Wayne, Blair, Trevor, Maurice
Oct. 31	Open House - CANCELLED			
Nov. 3	Tour	7:30 pm	Observatory	Wayne S, Blair S
Nov. 7	Open House	7:30 pm	Observatory	*HELP*
Nov. 12	Business Meeting: Maurice's office	7:30 pm	230-177 Victoria St.	*all welcome!*
Nov. 14	Open House	7:30 pm	Observatory	*HELP*
Nov. 21	Open House	7:30 pm	Observatory	Bob N, *HELP

For an up to date list of the Volunteer Schedule visit our website in the MEMBERS AREA
www.rasc.ca/princegeorge

Editorial

by Brian Battersby

I learned two things in the past couple of weeks. First, large plasma TV's are very, very cool. Second if you do not have an HD capable digital cable box and you order the HD pay-per-view sports channel you can hear the hockey game but not see it.

How does this relate to astronomy you ask?

The speed of light is 299, 792, 458 meters per second.

Electromagnetic radiation (a.k.a. light) exerts a measurable pressure on any object exposed to it. If the radiation is coming from one direction this pressure is tripled. If the object the radiation is striking is a perfect reflector the pressure is doubled again.

Therefore, if a man (perfect reflector) walks in to a Future Shop once he gets a mere 20' from the massive display of plasma TV's (directional radiation) he hasn't got a chance. The light from the TV's entered his eye in about 20 nanoseconds and the pressure to buy the TV increased by a factor of 6.

If his wife is with him he is not a perfect reflector so the pressure to buy the TV is only triple.

Don't forget to buy the HD digital cable box.

Our Vanishing Night

A couple of members pointed out an interesting National Geographic article titled: Our Vanishing Night. It discusses the many problems caused by our needless desire to light up the night sky. As per National Geographic's norm there are some excellent photos with the article. Due to copyright I could not print it in the newsletter but you can read it on the web at: http://ngm.nationalgeographic.com/2008/11/light-pollution/klinkenborg-text

P.G. Centre News

New gravel was spread over the driveway and observing deck. Thanks to Maurice, Jim and Glen.

***

2 red dot finders, an All-Sky camera and a hand dolly have been purchased. A video capture card for the All-Sky meteor monitor setup is on back order.

***

A motor to drive the dome slit has been acquired at no cost.

***

The new RASC fee collection agreement has been reviewed and signed.

***

The gaming grant "wish list" was reviewed and updated.

RASC eNews

Across the RASC

Canadian Comet Discovery: C/2008 T2 Cardinal

Rob Cardinal, an astronomer at the University of Calgary's Rothney Astrophysical Observatory, has discovered a 16th magnitude comet. This is the second time in the past decade that a comet has been discovered by a Canadian observer using a Canadian telescope. Oct 14, 2008, 22:03

Northern Skies

The Sky This Month - October 2008

This month we will waunder up the ecliptic and examine a few of the brighter objects. Oct 3, 2008

Astronomy Outreach

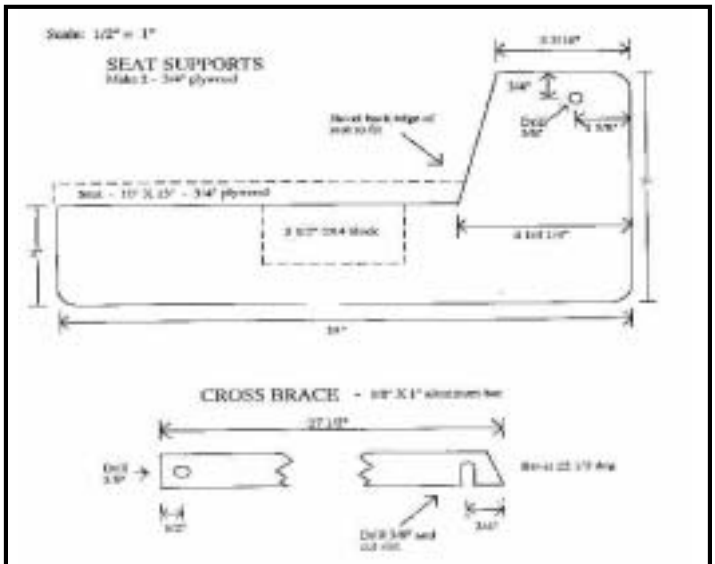
Regina Centre joins with RSO

Regina Centre members and the Regina Symphony Orchestra joined forces to present Holst's "The Planets" accompanied by the planets (well, Jupiter and the Moon). Sep 25, 2008, 13:10

Announcements

2009 Observer's Calendar Now Shipping!

The 2009 Observer's Calendar is now shipping! This attractive wall calendar features outstanding astronomical photos prepared by members of the RASC - find out more about how to order yours!
Sep 23, 2008, 10:01



Article for this diagram on page 4

The Observing Chair Project

by Doug Wayland

Thanks to Doug Wayland for this item. Doug found this item on a web page and built the chair. His careful workmanship shows in the well crafted result. ~ Gil Self.

This observer's seat, fully adjustable in height and which folds compactly for transport, can be built in two or three evenings at a cost of about $35. This project was designed by Charles P. Carlson, following a concept developed by Dave Trott. Both are members of the Denver Astronomical Society. A special thanks to Bert Harless. At the bottom of the page will be a diagram of the seat supports and cross brace.

Materials List:

Diagram on page 4

1 - 8' 2X4 stud; premium grade recommended
(should be straight and not subject to splintering)
3/4" plywood scraps: 1 - 10" X 13"
2 - 7" X 14"
1 - 1" X 1/8" aluminum bar, length at least 28"
1 - 3" door hinge
6 - 1" screws to fit door hinge
1 - 2 3/4" chest handle
4 - 1" screws to fit chest handle
1 - 3/8" X 5 1/2" hex bolt
1 - 3/8" locknut
2 - 3/8" X 2 1/2" lag screws
2 - 3/8" washers
2 - 3/8" X 2" lag screws
8 - 2" X 10 flathead wood screws
5 - flathead nails, at least 1" long
24" length of 4" wide adhesive-backed stair safety tread (3M product)
4" length of 3/4" rubber fuel tubing (from automotive store)
Velcro strips, approx. 12" long (from fabric store)
4 - large thumb tacks or similar fasteners, to fasten Velcro strips
1 - piece scrap cardboard, approx. 2" X 3"

Assembly Instructions

l. Cut the 2X4 into four lengths, as follows: 2 pieces 34" for front and back uprights, 1 piece 24" for lower crosspiece; left-over block to be used for seat assembly will be approximately 3 1/2" in length.
2. Bevel one end of each of the 34" 2x4 uprights to 22 1/2 deg.
3. Center and glue bottom crosspiece flush with the beveled end (long dimension edge) of one of the uprights; secure with the two 3/8" X 2 1/2 lag screws and 3/8" washers.
4. Cut the two seat supports as shown in diagram, and drill the 3/8" holes; this piece should be cut and drilled to precise dimensions for proper fit (this is the only piece where exact dimensions are critical).
5. Cut or trim the 10"X13" plywood piece to form seat; bevel one long edge to match angle of seat supports (approx. 30 degrees); round corners.
6. Center and glue the 3 1/2" 2X4 piece on the bottom of the seat, about 1 1/2" from back (beveled) edge as shown in diagram; fasten from the bottom of the 2X4 block with four of the 2" X 10 FH woodscrews in a square pattern, approx. 2" by 2".
7. Cut and glue a piece of cardboard to one side of the 2X4 block (the purpose of this step is to form a shim which will prevent the seat assembly from binding on the front upright).
8. Assemble seat as shown in photo and diagram, aligning seat supports and fastening them to the 2X4 block with the remaining four 2"X10 wood screws.
9. At this point, it is recommended that the wood parts be finished with several coats of a good quality polyurethane varnish or similar waterproof finish.
10. Lay out the front and back uprights, butting them at the square ends and with the shorter dimension formed by the bevels facing up; install door hinge to join square ends.
11. Close the uprights to a 45 degree angle; install the aluminum crossbrace on one side of the rear upright, using one 3/8" X 2" lag screws; install screw 2" from bottom end of upright, leaving slight slack so that the crossbrace freely rotates; install the other 3/8" X 2" lag screw at the corresponding location on the front upright, leaving enough slack so that the slotted end of the crossbrace snaps
down to a snug fit.
12. Install chest hinge at top of front upright.
13. Trim the 4" stair safety tread to 3" wide; install on the front upright, starting about 3" from the top.
14. Slit 3/4" fuel tube; spread and install on rear edge of the seat between the seat supports using the flathead nails to secure;
hammer nails to tight fit against rubber to prevent rubbing against stair safety tread.
15. Slip the seat assembly in place against the front upright as shown in photo and install the 3/8" X 5 1/2" hexbolt through the holes provided; fasten with 3/8" locknut (but be careful not to overtighten the locknut so as to bend the seat supports and cause binding).
16. Overlap about 3" of the Velcro strips and fasten to the back of the rear upright; fit so that these form a strap to secure the seat in the folded position (Note: Some other arrangement with leather or cloth straps could be substituted).
17. Test procedure: Take the chair out under a dark sky, place behind the eyepiece of your telescope, adjust to a comfortable height, and enjoy the view!

Original Plans: http://www.tulsawalk.com/projects/denverobserverchair/denverastro/seat.html

Modified Plans: http://www.tulsawalk.com/projects/denverobserverchair/index.html

How Newton's Telescope Changed the World

by Will Kalif

Sir Isaac Newton is often considered as the greatest Astronomer and Mathematician to ever live. There is a lot of validity to this claim. This article looks at his famous reflector telescope and describes some of his discoveries.

A reflector telescope is one that uses a mirror rather than lenses to bend light and magnify images. Reflector telescopes, because they are easier to make and can be made in sizes much larger than refractors, are an invention that changed astronomy and our understanding of the universe. The largest refractor telescope in the world is forty inches in diameter and reflector telescopes dwarf this in comparison. There are currently several reflector type scopes that are over four hundred inches in diameter.

Why a reflector is better than a refractor

If you are familiar with a prism or a rainbow you can understand why reflectors are superior to refractors. When light passes through glass the different bands (or colors) pass through at different angles and this causes aberrations or problems in the images. This is called chromatic aberration and it gives us distorted views of what we see through a lens. In the time of Newton glass making and lens making was very primitive and the problems of chromatic aberration were not yet overcome. Today we can make lenses that have almost no chromatic aberration but we can't make them very large. When a lens gets to be really large it gets very heavy and its own weight will distort the lens and ruin the image.

Newton's telescope solved these problems. A mirror doesn't pass light through it. It simply bounces all the light off the surface. There is no chromatic aberration at all. And because you only need to bounce light off the surface you can place the whole mirror on a supporting structure or base which takes a lot of the weight off the mirror. This way you can build much larger mirrors without any distortion.

It is commonly thought that Newton invented the first reflector telescope but it isn't true. Credit for making the first reflector goes to and Italian Monk, Physicist, and Astronomer named Niccolo Zucchi. He published a book on Optics in the 1650's and it is this book that inspired Sir Isaac Newton to build his own telescope. Zucchi created his first reflector around 1616 while Newton completed his first (and famous) telescope in 1670. But while Zucchi did make some new discoveries with his telescope it didn't work well and was difficult to make and to use. It was Newton's telescope that worked really well and that brought the art and science of reflectors into the world of science.

The real Genius of Newton's Telescope

All of that stuff is remarkable but there is something much more important in Newton's Astronomy and in his telescope. He didn't after all, discover moons around Jupiter like Galileo did, or plot the return of a comet like Halley did. But what he did do was tie in Mathematics, Astronomy, and our understanding of the universe using his telescope and his theory of universal gravitation. He proved mathematically that gravitation was a two way operation and that while the earth pulled on a falling apple so the apple too pulled on the earth. This was clearly seen, calculated, and confirmed in the motions of heavenly bodies which was refined and made possible by the new science of reflector telescopes which we can credit to Newton.

Sir Isaac and his telescope carried on with the work of Copernicus and Galileo by furthering our understanding of the universe we live in and helping us to realize there are laws that govern the whole of the universe. And this rule holds true for falling apples and for planets revolving around stars.

The actual telescope that Newton built still survives today and is in the care of the Royal Society of London. They keep it on display in London and sometimes it travels the world as part of an exhibit.

About the author:
Want to learn more about telescopes? Visit the Telescope Nerd: **TelescopeNerd.com**

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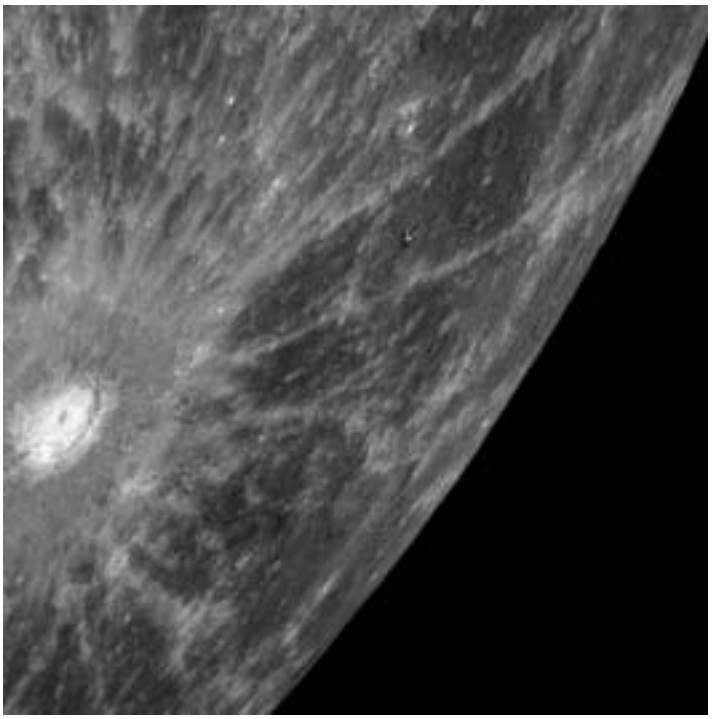
http://www.Free-Articles-Zone.com

NASA'S MESSENGER to Mercury

http://www.nasa.gov/mission_pages/messenger/main/index.html

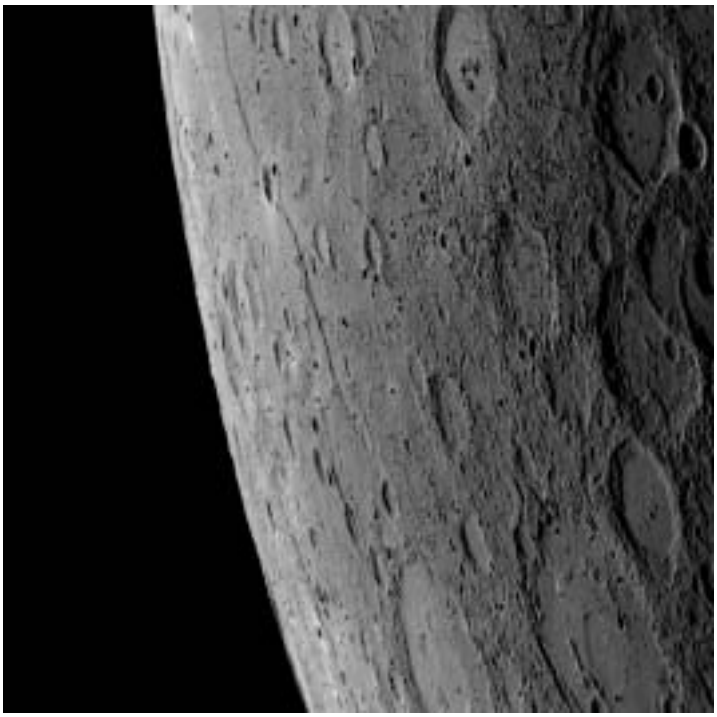


"A" Spectacular Rayed Crater

Date Acquired: October 6, 2008
Image Mission Elapsed Time (MET): 131773947
Instrument: Narrow Angle Camera (NAC) of the Mercury Dual Imaging System (MDIS)
Resolution: 530 meters/pixel (0.33 miles/pixel)\
Scale: The bright rayed crater is approximately 80 kilometers (50 miles) in diameter
Spacecraft Altitude: 20,600 kilometers (12,800 miles)

Of Interest: This NAC image shows a bright crater with an extensive system of impact ejecta rays; the crater is also clearly visible on the southern portion of Mercury near the limb of the planet in the departure full-planet image. This impact crater and its associated system of rays were originally detected in 1969 as a "bright feature" in radar images at 12.5-centimeter wavelength obtained by the Goldstone Observatory in California. Subsequently, about a decade ago, radar images acquired by the Arecibo Observatory in Puerto Rico clearly revealed this feature to be a crater with a fresh system of rays of rough material radiating outward from it. This feature has been referred to simply as feature "A." MESSENGER's recent Mercury flyby provided the first spacecraft images of feature "A," enabling this relatively young crater with its impressive set of rays to be seen here in close-up detail.

Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

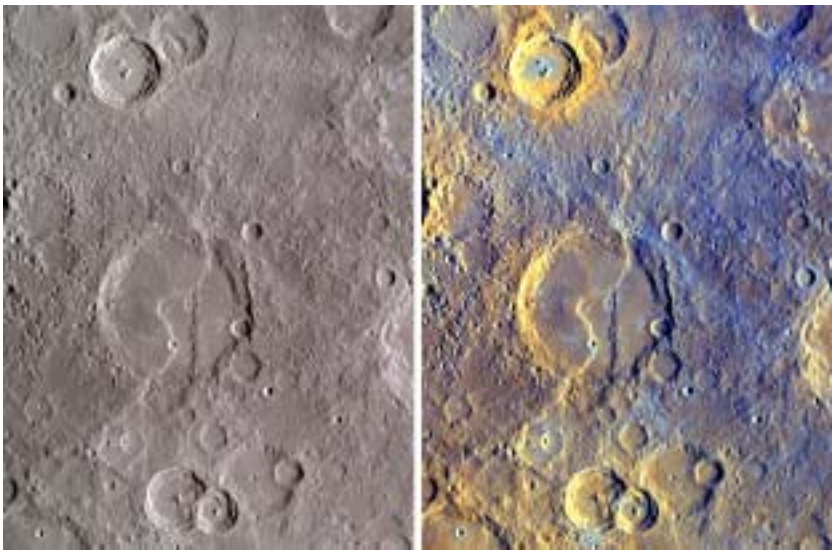


Mercury Shows Signs of Aging

Date Acquired: October 6, 2008
Image Mission Elapsed Time (MET): 131766454
Instrument: Narrow Angle Camera (NAC) of the Mercury Dual Imaging System (MDIS)
Resolution: 420 meters/pixel (0.26 miles/pixel) on the right side of the image
Scale: The small crater superimposed on the long cliff is about 30 kilometers (19 miles) in diameter
Spacecraft Altitude: 16,500 kilometers (10,300 miles)

Of Interest: This dramatic NAC image was acquired about 56 minutes prior to MESSENGER's closest approach during the mission's recent Mercury flyby, as the spacecraft approached the planet's illuminated crescent. Prominent toward the horizon in this view of newly imaged terrain is a long cliff face. A small impact crater (about 30 kilometers, or 19 miles, in diameter) overlies this lengthy scarp. The scarp extends for over 400 kilometers (250 miles) and likely represents a sign of aging unique to Mercury among the planets in the Solar System. As time passes, the interior of a planet cools. However, the relative size of Mercury's central metallic core is larger than that of the other planets and hence has significantly affected the planet's geologic evolution. The numerous long scarps on Mercury are believed to be the surface expression of faults formed in the rocks of Mercury's crust as the interior of the planet cooled and contracted. This contraction compressed the surface and thrust some sections of crust over others, creating long curving cliffs like the one shown here.

Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

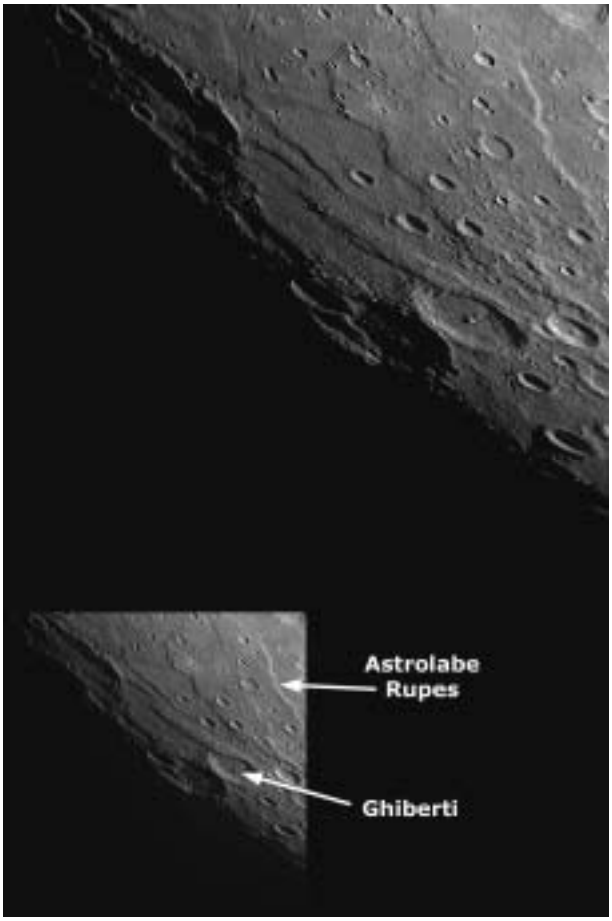


Exposing Mercury's Colors

Date Acquired: October 6, 2008
Image Mission Elapsed Time (MET): 131770496 - 131770546
Instrument: Wide Angle Camera (WAC) of the Mercury Dual Imaging System (MDIS)
Resolution: 460 meters/pixel (0.29 miles/pixel)
Scale: Th kur crater is 118 kilometers in diameter (73 miles)
Spacecraft Altitude: 2,500 kilometers (1,600 miles)

Of Interest: To the human eye, Mercury shows little color variation, especially in comparison to a colorful planet like Earth. But when images taken through many color filters are used in combination, differences in the properties of Mercury's surface can create a strikingly colorful view of the innermost planet. Shown here are two color images of Th kur, named for the Bengali poet, novelist, and Nobel laureate influential in the late 19th and early 20th centuries. The image on the left was produced by combining images from three WAC filters into red, green, and blue channels, as a general representation of the color seen by the human eye (though every person sees color slightly differently, as discussed for the full-planet color images.) The right image was created by statistically comparing and contrasting images taken through all 11 of the WAC's narrow-band color filters, which are sensitive to light not only in the visible portion of the spectrum but also to light that the human eye cannot see. This method greatly enhances subtle color differences in the rocks of Mercury's surface, providing insight into the compositional variations present on Mercury and the geologic processes that created those color differences. Visible on the floor of Th kur crater is the intersection of two ridges, seen here in unprecedented detail for the first time with MESSENGER's newly obtained images.

Credit: NASA/Johns Hopkins University Applied Physics Laboratory/ Arizona State University/Carnegie Institution of Washington



Astrolabe Rupes and More

Date Acquired: October 6, 2008
Image Mission Elapsed Time (MET): 131774936
Instrument: Narrow Angle Camera (NAC) of the Mercury Dual Imaging System (MDIS)
Resolution: 660 meters/pixel (0.41 miles/pixel)
Scale: Ghiberti crater is 123 kilometers in diameter (76 miles)
Spacecraft Altitude: 26,000 kilometers (16,000 miles)

Of Interest: This NAC image, taken about 85 minutes after MESSENGER's closest approach during the mission's second Mercury flyby, shows a view of Astrolabe Rupes, named for the ship of the French explorer Jules Dumont d'Urville. Rupes is the Latin word for cliff. Mercury's day/night transition (the terminator) is located on the left side of the image, and the Sun is striking the cliff face of Astrolabe Rupes in the upper right of the image. Also visible in the image are additional unnamed rupes, whose cliff faces are casting dark shadows. One of these rupes intersects the crater Ghiberti, named for the Italian Renaissance sculptor. Rupes on Mercury are thought to have formed as the interior of Mercury cooled and the planet consequently contracted slightly. Determining the number and extent of rupes on Mercury can thus be used to understand the thermal history of the planet.

Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

The Night Sky for November 2008

by Bob Nelson, PhD

Hi Folks,

As I write this, I have just finished packing for our Africa trip, and will be leaving the next day. When you-all read this (around Oct. 28), I'll be on the Island of Pemba (next to Zanzibar) in Tanzania (the former German East Africa). I'll have been diving in the clear Indian Ocean (I hope) before my wife and I travel on to Arusha and the start of a 6-night safari. (Previously to that we will have been in the Cape Town area with short visits to Johannesburg and Victoria Falls.) We finish our trip in Kenya somewhere, flying home from Nairobi via Amsterdam. It will have been quite a trip, and I hope to share some scenic images with you when I get back (along with those from the South African Large telescope).

Anyway, here is what is going on in the sky this month:

MERCURY is still visible just before sunrise at the beginning of the month. On that date, it will lie some 12° above the ESE horizon at sunrise (having risen about 90 minutes earlier). However, as the month progresses, it gets closer to the Sun and becomes lost in the latter's mighty glare, reaching superior conjunction somewhere around Nov 28..

VENUS is an evening object until well into 2009. At month's start, it lies almost 19° above the SSW at sunset and is a 14" gibbous disk of magnitude 4.0. By month's end, however, these numbers have risen to 24° above the horizon, a 17" gibbous disk but magnitude still 4.1. It will reach greatest eastern elongation in the new year (around Jan 15) and will then be half-illuminated.

MARS, in Libra until November 16, after which it passes into Scorpius, until November 27, after which it passes into Ophiuchus (busy planet), is lost in the glare of the Sun this month.

JUPITER, in Sagittarius until 2009 (Jan), is an early evening object this month. At mid-month it lies very close to the meridian at sunset, some 13° up, and sets over 3 hours later (at 19:43). It's then a 35" disk of magnitude -2.1.

SATURN, in Leo until 2009 (Sept), is a morning object all month. At mid-month, (having risen at 01:23), it lies high (42° up) in the southern sky at sunrise. It's a 17" disk of magnitude 1.1 and should be a splendid sight.

URANUS, in Aquarius until 2009 (March), is largely an evening object this month. At sunset, it lies some 15° above the SE horizon, transits at 19:49 and sets at 01:28 next morning. It's a 4" disk of magnitude 5.8.

NEPTUNE, in Capricornus until 2010 (March), is an evening object this month. At mid-month it lies some 17° above the SSE horizon at sunset. It transits at 18:17 and sets at 22:57 PST. As usual, it's a 2.3" disk at about magnitude 8.0.

Standard time returns November 2. Yeah!!! NOTE: A search on Wikipedia revealed that the ridiculous idea of daylight savings time was first proposed in 1907 by an English builder, William Willett, in a move to increase late-day leisure time. His initiative failed until 1916, when, during WW I, Germany was the first country to institute the move, followed quickly by its allies and, later, most of Europe. The U.S. adopted it in 1918. Since then, it has been controversial with a number of jurisdictions (notably SK, AZ, FL, and HI) opting out (and there have been recent attempts in AK, IN, NV to also kill the idea). In spite of numerous studies showing NO energy savings at all (!!), and numerous downsides (confusion, tired workers, traffic deaths, etc.) George the Terrible made it worse in 2007 by forcing us all to start 3 weeks earlier in the spring (now, it's the second Sunday in March), and 1 week later in the fall (now, it's the first Sunday in November). Microsoft Windows has done a good job (IMHO) in dealing with this bastard system of date and time, but confusion remains (especially for this writer who has to be so careful!). Sometimes I just feel like working in UTC and to heck with it all! Sadly, this deplorable idea will never get revoked in my lifetime, I would bet.

CONSTELLATIONS to look for in November (at 21:00 PST) are Sculptor, Western Cetus, Pisces and Andromeda.

Continued: pg. 9

Sculptor (Scl, "The Sculptor's Tools"), another southern constellation at the limit of our visibility here in Prince George lies out of the Milky Way. It contains NGC 253, a spectacular spiral galaxy, a number of fainter galaxies, a faint globular (NGC 288) and, near the latter, the south galactic pole which, at declination 27.5 degrees south, is just visible from Prince George. The brightest star, Alpha Sculptoris, is a B7 giant radiating 1700 times solar, has a radius of 7 times solar, and a mass of 5.5 solar. The reason it is so dim (at 4.3 mags) is that it lies at a distance of 670 light years. Its claim to fame – and the reason I am telling you all this – is that at an age of 81 million years, it is at the end of its hydrogen-fusing cycle. The core, which is comprised almost entirely of helium, will ignite after the star expands, the surface cools, and the star becomes a red giant. The star is presently classified as a slow rotator; this relative stillness results in a lower than solar surface helium abundance (no mixing) and an enhanced abundance of heavier elements such as silicon, titanium and manganese. The magnetic field generates star spots, enabling astronomers to measure its rotation period. The magnetic field occasionally flips and controls the behaviour of a close-in cloud of circumstellar gas. [Taken in part from http://www.astro.uiuc.edu/~kaler/sow/fomalhaut.html.]

Western Cetus (Cet, "The Sea Monster"), contains a number of galaxies, including M77, which is a bright and compact spiral galaxy, contains three distinct sets of spiral arms and lies about 60 million light years distant. According to Burnham, this and NGC 4594 in Virgo (The "Sombrero") were the first two systems in which very large redshifts were discovered, leading to the discovery of the expanding universe.

Pisces (Psc, "The Fishes"), lies on the Zodiac. It contains M74, according to Burnham, one of the faintest and most elusive of the Messier objects requiring a dark sky and suitable eyepiece. Pisces also contains, according to Norton's 2000.0 Star Atlas, the galaxies NGC 487 and 524.

Andromeda (And, "The Princess of Ethiopia"), is familiar to most of us; it contains the "Great Andromeda Galaxy" M31 along with its satellite ellipticals, M32 and NGC 205 (a.k.a. M110 -- but not really on Messier's list). According to Burnham (and the references therein), M31 has been known at least as far back as 905 AD; it was known as "The Little Cloud" and appeared on star charts long before the invention of the telescope in 1609. Simon Marius is usually credited with the first telescopic observation in 1611 or 1612. Early observers thought the "nebula" consisted of glowing gases but long photographic exposures early in the 1900s revealed it to be a vast star system. Edwin Hubble, observing Cepheid variables with the 100" Mt Wilson telescope, established the distance as around 90,000 light years, well out of this galaxy. Later, corrected calculations in 1953 extended the distance out to 2.2 million light years. We now know that M31, along with M33 and our galaxy, are the three largest members of the "Local Group", gravitationally bound and holding numerous smaller galaxies, including the Large and Small Megallanic Clouds. Needless to say, M31 has been the subject of many studies by professionals using the largest telescopes and is also a fine object for amateur study and photography.

Clear skies to all,
Bob

The Chemical Weather Report

"Sunny tomorrow with highs in the mid-70s. There's going to be some carbon monoxide blowing in from forest fires, and all that sunshine is predicted to bring a surge in ground-level ozone by afternoon. Old and young people and anyone with lung conditions are advised to stay indoors between 3 and 5 p.m."

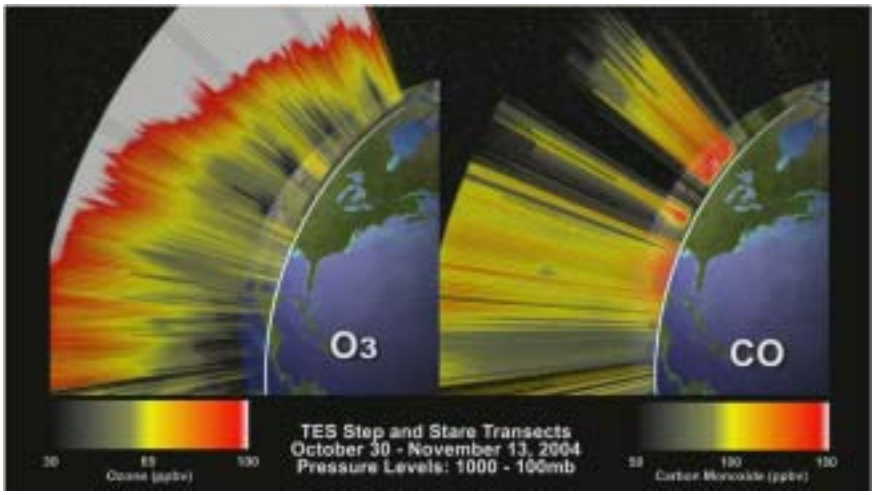
Whoever heard of a weather report like that?

Get used to it. Weather reports of the future are going to tell you a lot more about the atmosphere than just how warm and rainy it is. In the same way that satellite observations of Earth revolutionized basic weather forecasting in the 1970s and 80s, satellite tracking of air pollution is about to revolutionize the forecasting of air quality. Such forecasts could help people plan around high levels of ground-level ozone—a dangerous lung irritant—just as they now plan around bad storms.

"The phrase that people have used is chemical weather forecasting," says Kevin Bowman of NASA's Jet Propulsion Laboratory. Bowman is a senior member of the technical staff for the Tropospheric Emission Spectrometer, one of four scientific sensors on NASA's Aura satellite.

Aura and other NASA satellites track pollution in the same way that astronomers know the chemical composition of stars and distant planetary atmospheres: using spectrometry. By breaking the light from a planet or star into its spectrum of colors, scientists can read off the atmosphere's gases by looking at the "fingerprint" of wavelengths absorbed or emitted by those chemicals. From Earth orbit, pollution-watching satellites use this trick to measure trace gases such as carbon monoxide, nitrogen oxide, and ozone.

However, as Bowman explains, "Polar sun-synchronous satellites such as Aura are limited at best to two overpasses per day." A recent report by the National Research Council recommends putting a pollution-watching satellite into geosynchronous orbit—a special very high-altitude orbit above the equator in which satellites make only one orbit per day, thus seeming to hover over the same spot on the equator below. There, this new satellite, called GEO-CAPE (Geostationary Coastal and Air Pollution Events), would give scientists a continuous eye in the sky, allowing them to predict daily pollution levels just as meteorologists predict storms.



Example of visualization of data from the Tropospheric Emission Spectrometer. These frames are from an animation that steps through transects of the atmosphere profiling vertical ozone and carbon monoxide concentrations, combining all tracks of the Aura satellite during a given two week period.

"NASA is beginning to investigate what it would take to build an instrument like this," Bowman says. Such a chemical weather satellite could be in orbit as soon as 2013, according to the NRC report. Weather forecasts might never be the same.

Learn more about the Tropospheric Emission Spectrometer at tes.jpl.nasa.gov.
Kids can learn some elementary smog chemistry while making "Gummy Greenhouse Gases" out of gumdrops at spaceplace.nasa.gov/en/kids/tes/gumdrops.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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