PeGASus

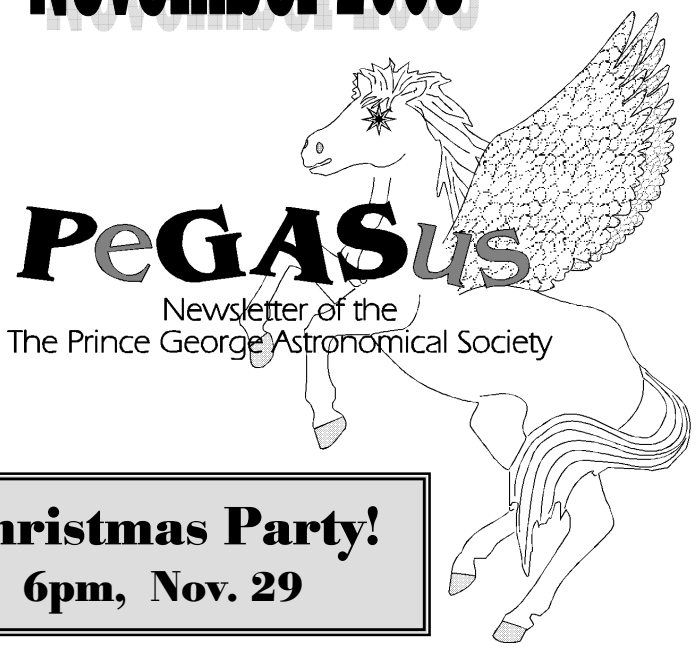
Newsletter of the

Royal Astronomical Society of Canada: Prince George Centre

Published: January to May & September to November. www/rasc.ca/princegeorge

November 2008

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



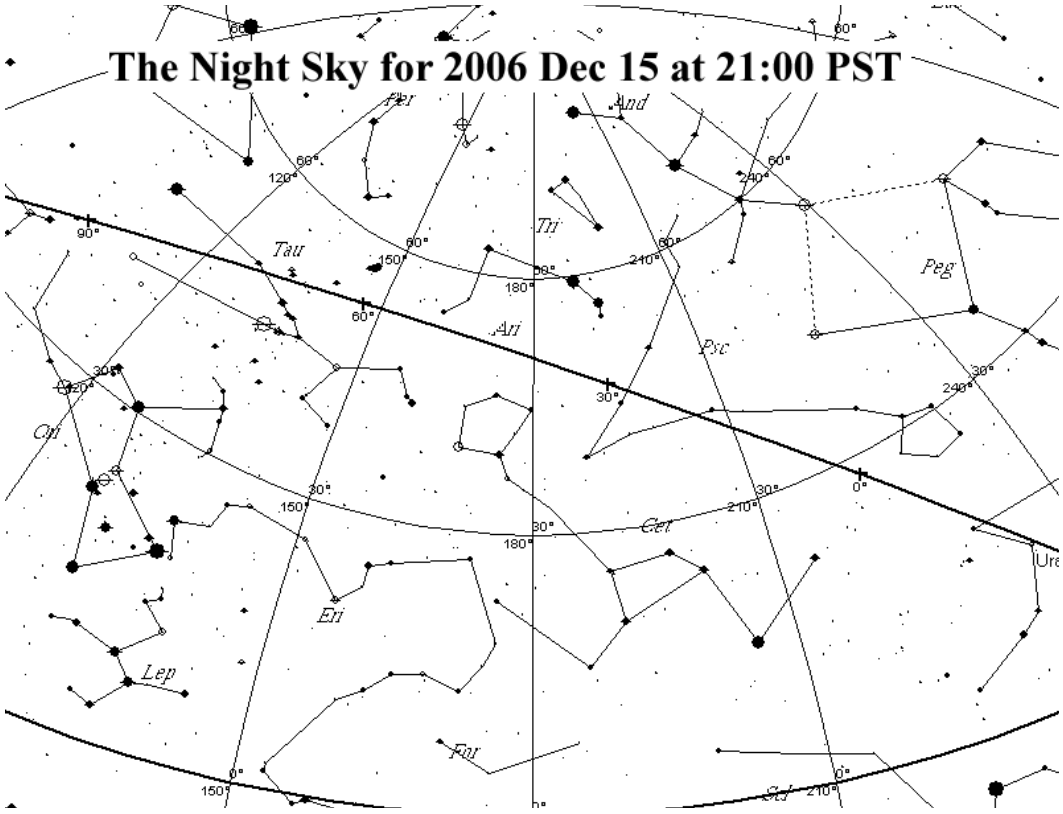
In Issue # 170

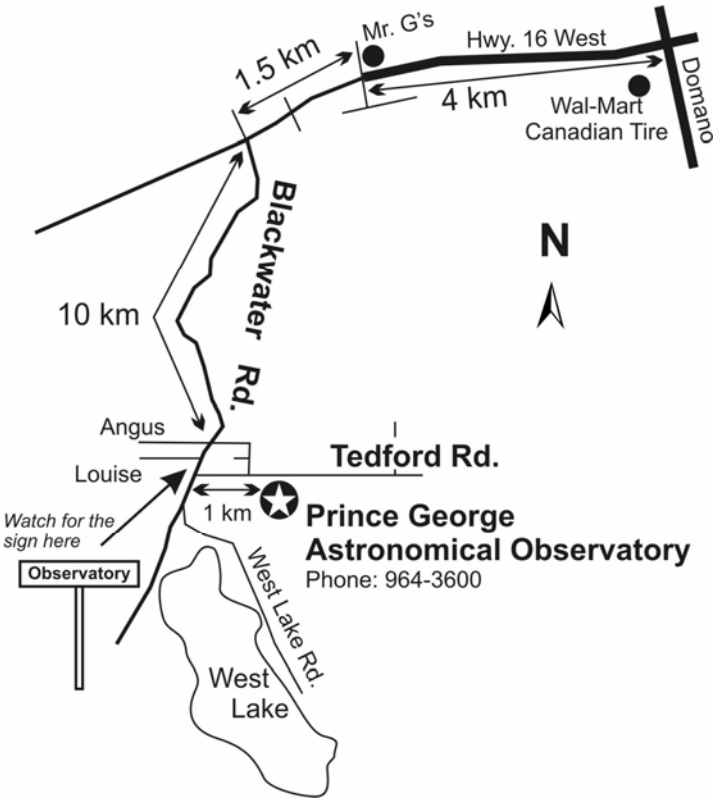
Christmas Party!
6pm, Nov. 29

The RASC: Prince George Centre meets next,

Saturday November 29, 6:00 pm

at the Observatory for the 8th Annual Christmas Party





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Executive, 2008 / 2009

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Brian Battersby

Contributions to the newsletter are welcome.

Deadline for the next issue is
January 21, 2008

PeGASus Editor
Brian Battersby
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Coming Events

To Volunteer to help run an event please contact Brian Battersby.
brianbattersby73@yahoo.ca
Phone: 614-3316 (cel) 612-4623 (home)

Date	*Event*	*Time*	*Place*	*Volunteers*
Nov. 29	Christmas Party Social	6:00 pm	Observatory	*everyone welcome!*
Jan. 14	Business Meeting	7:30 pm	Arctic Manufacturing, 3233 Hart Hwy.	
Jan. 17	NOVA Class #1	7:30 pm	Observatory	Blair S.
Jan. 24	Social Meeting	7:30 pm	Observatory	*everyone welcome!*
Jan. 31	NOVA Class #2	7:30 pm	Observatory	TBA
Feb. 7	NOVA Class #3	7:30 pm	Observatory	TBA
Feb. 21	NOVA Class #4	7:30 pm	Observatory	Blair S.
Feb. 28	Social Meeting	7:30 pm	Observatory	*everyone welcome!*

For an up to date list of the Volunteer Schedule visit our website in the MEMBERS AREA

Editorial

by Brian Battersby

Thankfully, I seem to have run out of room for an editorial. I say "thankfully" because I was not prepared to write one this month. Too much on the go!

I will leave you with one thought though IYA, International Year of Astronomy. 2009 has been designated the International Year of Astronomy by the United Nations. All the Canadian astronomy organizations are currently scrambling to finalize their plans and bring projects with a "national" scope to fruition.

You can learn more about IYA by visiting:
www.astronomy2009.ca
www.astronomy2009.org

P.G. Centre News

The 2008 / 2009 Executive was Elected at the AGM on October 25.

President:	Gil Self
Vice President:	Maurice Sluka
Secretary:	Glen Harris
Treasurer:	Brian Battersby
National Rep:	Brian Battersby
Members at Large:	Patrick Byrne, Hugh Kennedy
	Bob Nelson, Trevor Padgett
	Wayne Sanders, Blair Stunder
	Jim Toews, Jim Van Doren
	Doug Wayland

***

The All-Sky meteor camera has been installed at the observatory.

***

Blair Stunder has taken on the job of Tour Coordinator.

***

The members social meetings will be potluck in the new year.

***

The gaming grant has been submitted.

RASC eNews

Announcements
RASC Members Briggs and Newton Co-discover Supernova
Toronto-based member Eric Briggs and Arizona-based member Jack Newton co-discover Supernova 2008hj as part of the Puckett Observatory Supernova Search
Nov 23, 2008, 11:32

Announcements
Observer's Handbook a "Celestial Success"
Peter Calamai, science columnist of the Toronto Star features the 2009 Observer's Handbook.
Nov 23, 2008, 11:11

Announcements
December 2008 Journal on-line!
The December 2008 Journal is now available!
Nov 13, 2008, 22:16

Across the RASC
Consolidated Index to the Bulletin Now On-line
Walter MacDonald of the Kingston Centre has added another important element to our Printed History. He has put together a consolidated index to the print edition of the *Bulletin* which was published by the Society from 1991-96.
Nov 10, 2008, 10:55

Announcements
Member Handbooks now shipping!
The initial mail out of 2009 Handbooks to members started Monday. Current members should start receiving theirs any day now.
Nov 4, 2008, 15:41

Northern Skies
The Sky This Month - November2008
The constellation Cetus is fourth in area and there is no shortage of objects to hunt and observe.
Nov 2, 2008, 11:45

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 wander up the ecliptic and examine a few of the brighter objects
Oct 3, 2008, 01:29

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

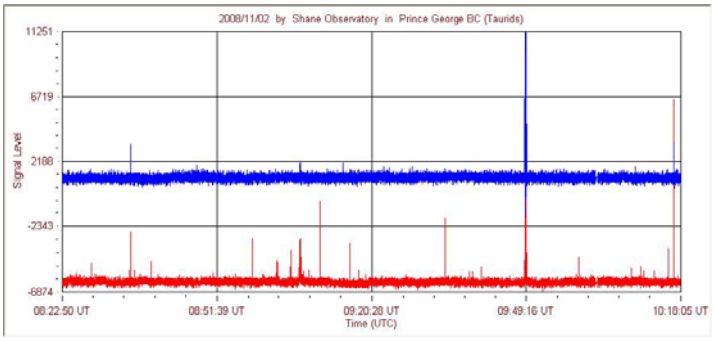
All Sky Camera

by Glen Harris

The All Sky camera has been installed at the observatory and its acquired information will augment data from the existing Radio-SkyPipe program. Several meteors from the Taurid meteor shower in early November were detected during the testing phase and minor adjustments were made to synchronize the timing of the two applications. This brings to three the number of sites operating an All Sky camera in the Prince George area. Using special software, observatory data co-related with a station at Reid Lake and another in the Prince George bowl area can triangulate the approximate impact location of a detected fireball type meteor that manages to survive it's plunge through the atmosphere.

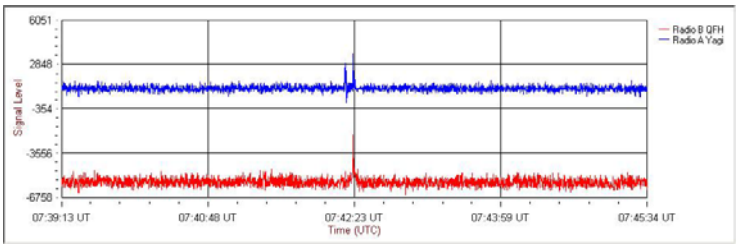
With the installation of the observatory camera, we became a member of a North American All-Sky network that collects meteor data. Information on the organization can be found on their web site at http://people.stu.ca/~jamesw/AllSkyNetwork.htm

Glen Harris



Above, November 2, 2008:
The future observatory AllSky camera I've got set up for testing at my home captured an image of a Taurid meteor early this morning. The Radio-SkyPipe program also caught it. Attached are a zipped AVI file and related portion of the R-SP graph. The 1 hour time discrepancy is due to me prematurely changing the time to PST on one of my Windows 2000 machines.

Glen



Left, November 9, 2008:
The AllSky camera captured another meteor, this time a Nouth Taurid. The Leonids are due on the 17th of November so I hope to have more images then.

Glen

How to Explore the Night Sky Without A Telescope

by Will Kalif

You don't need a telescope to see a lot of wonderful things in the night sky. For example five of the planets are often readily visible with the naked eye. There are lots of amazing things you can see and this guide will help you find them.

To maximize what you can see in the night sky there are a few things you should do as preparation. Of course the first thing you need is a clear and cloudless night. And this includes the moon. You should try to do your observing on a night with no moon; or at the least the smallest sliver of moon possible. Its brightness will wash out many of the dimmest and most dramatic objects in the sky. Second you should consider your comfort. Make sure you dress appropriately for the weather and bring extra layers of clothing if you are observing during cold months. The temperature late in the evening can be substantially lower than it is during the day and because observing the sky means not moving around much you will be even colder. Bring along any items to help your comfort like a lawn chair or a reclining lawn chair so you can look up without craning your neck.

Find yourself a spot to observe from that is as dark as possible. This means get away from street lights, city lights, house lights, or any other type of light source. Ideally you should drive away from any city that is nearby. If this is not possible then try to find the darkest spot you can. Man-made Light sources have an effect on the night sky by washing out the dimmer objects and they have an effect on your eyes by causing your pupils to close. This will decrease your ability to see the dimmer objects.

Beginning your observing is the most critical time for one big reason and this is why a lot of people don't realize how rich the night sky really is. It takes your eyes up to a half an hour to fully adjust to the darkness outside. If you go outside and immediately begin looking for object in the sky you may be disappointed but this is because your eyes haven't adjusted yet! Give it some time and let your eyes fully adjust and you will be amazed at how many more things you see in just a half hour time.

Equipment and stuff to bring along

Get some star maps, planet charts, and reference materials and bring them right outside with you. They will help you to find various objects. But it will be dark outside so you won't be able to read them! And if you turn on some kind of a light or flashlight your night vision will be ruined. But there is a way to read your charts and materials without ruining your night vision. Cover your flashlight with some type of red cellophane or tape so it only gives off a dim red glow. The reduction in light will have less of an effect on your viewing and your eyes are very insensitive to red light so your pupils will not dilate. You can buy flashlights with red covers online, at astronomy and optical shops, or even at military surplus stores.

Suggested Materials List:
•Lawn Chair or Reclining Chair
•Constellation Chart
•Planetary Chart
•Lunar Chart
•Plenty of Warm clothing
•Flashlight covered with red cellophane
•Snacks and hot beverages

Things to See

The first place you can start with is the moon (If it is out). And the best viewing will be when it is only a think crescent. This is because when it is like this the sun is casting light on it at a very sharp angle and the surface features will cast long shadows which makes them easier to see. With a full or near full moon the light hits the surface of the moon directly and casts no shadows.

The Milky Way Galaxy – Our solar system is part of a tremendous spiral galaxy called the Milky Way galaxy. You can see this galaxy as a band of diffuse light that stretches across the sky. It takes dark skies and well adjusted night vision to see it but it is quite a remarkable sight. Every star and constellation map will show you where the milky way stretches across the sky.
The Constellations – Finding and identifying various constellations can be a lot of fun. Each constellation represents an object, animal, or historic figure; and learning the story behind them can also be a lot of fun. Identifying constellations is also the only way to

go deeper and find other objects like planets and comets. They form the background that everything moves within and they give you a frame of reference for finding these objects. Identifying constellations should be part of every star gazing event you undertake.

The Planets – The planets move around in the sky quite a bit and sometimes they are too close to the position of the sun which means they are not visible at night but five of the planets, when in the right position are easily visible with the naked eye. These are Mercury, Venus, Mars, Jupiter and Saturn. And often times these planets are the brightest objects in the sky. Refer to you planet charts to find current locations of them. One rule of thumb for figuring out whether something is a star or a planet is whether or not it twinkles. Stars twinkle and planets do not. So if you locate an object that you believe is a planet you can watch it for several minutes to see if it twinkles like other stars. If it does not then chances are good you have found a planet.

Colorful Stars – Stars are not all white. This is a common misunderstanding that people have. Stars come in a wide variety of brilliant colors and some of the more notable ones are the bright red Betelgeuse in Orion, the bright light-blue Rigel in Orion, the yellowish-white Altair in Aquila, and the bright red Antares in Scorpio. Finding and identifying these colorful stars can be a lot of fun. It can also be quite easy because some of the brightest stars in the sky are also very colorful from white to blue and red.

Some Objects of Particular Note

There are two very unique objects that are very easily seen with the naked eye on a dark night in the northern hemisphere. These are the Andromeda galaxy and the Hercules Nebula. They appear as tiny wisps of white smoke that look like small cotton balls. Once you start getting familiar with the constellations you should look for these two objects. The Andromeda galaxy is in the constellation Andromeda and the Hercules nebula is in the constellation Hercules.

Periodic and occasional Objects

The night sky is filled with a lot of objects that come and go in different patterns. Some of them, like meteor showers, occur at around the same time every year. This is when the Earth passes through clouds of space debris. You can check a chart of meteor showers and plan an evening or several evening of watching them. Some meteor showers can give as many as 120 falling stars every hour.

Comets – These can be difficult to view because they are often very dim. But occasionally a comet will become very bright and be easily visible with the naked eye.

The night sky is more than just the moon and the stars. It is a extraordinarily rich environment with objects of all kinds. And given a little bit of time and dark skies you will discover and explore many of the beautiful secrets that it holds; and you can do it without a telescope. All you need is dark skies, a few charts, and a little bit of time.

About the author:
Learn more about the wonders of the night sky at the authors website: **TelescopeNerd.com**

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

What's Out There

by Fae Collins Mooney

It began with Galileo Galilei, 400 years ago...

...when he first turned his telescope skyward in 1609. And with those great discoveries that followed - of four grand satellites orbiting Jupiter, of Venus displaying phases like the Moon, and of the star-stippled Milky Way with a star complement too numerous to count - that we take so much for granted in our 21st century. It marked the beginning, four centuries ago, of a scientific revolution that led to the challenge of our beliefs, and the transformation of our perspective on not only our own self-importance but also our perceived geocentric place in a universe that was becoming much more massive and expansive than ever contemplated.

And it continued 40 years ago…

...with an event that occurred in December of 1968, that stirred the imagination of Earth-bound humans and forever altered the perspective that was initiated back in 1609. It was the Apollo 8 mission. We saw, for the first time in human history, images of Earth from space, as captured by the crewmembers when they emerged from transiting the far side of the Moon (the Apollo 8 crew were the first humans to orbit the Moon). Looking homeward, seeing for the first time the sight of a gibbous Earth rising above the Moon's bleak landscape, changed not only how we view our home world but also our perception of our place in the cosmos... Earth - home - a precious blue-green marble set in space, was a planet too, a member of the Sun's family (and a rather small member at that). We saw, and understood, our place as residents in the suburbs of the Milky Way Galaxy as never before...

And it continues in the 12 months ahead... the United Nations has designated 2009 the International Year of Astronomy (or IYA).

Four centuries ago Galileo turned his telescope skyward and saw our neighbouring planets for the first time... Forty years ago, in a century now past, astronauts, from the vantage point of the Moon, saw, suspended in the black expanse of space, our home planet for the first time…

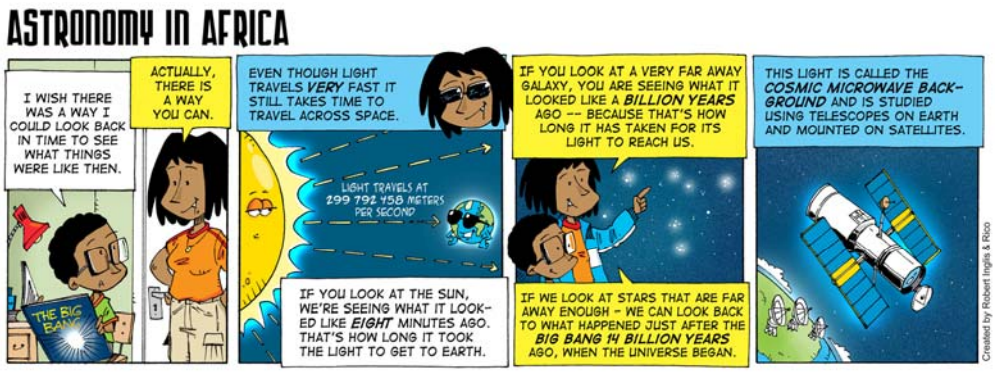
And in this International Year of Astronomy, we, as amateur astronomers, have the opportunity to share the Universe with the world, and share in their awe and wonder as they see it for themselves - for the very first time.

"May the dreams and aspirations of humanity always be as infinite as space itself."
- Chris Johns, editor in chief, National Geographic: The Once and Future Frontier - Space

"It's a beautiful universe out there, and Earth is a part of it. Enjoy!"
- Robert Naeye, editor in chief, Sky & Telescope*'s special edition for the IYA,* Beautiful Universe

"...a Merry Christmas, and God bless all of you - all of you on the good Earth."
- astronaut Frank Borman, ending Apollo 8's historic Christmas Eve message to Earth

And a Happy International Year of Astronomy too...



The Night Sky for November 2008

by Bob Nelson, PhD

Hi Folks,

As I write this, my wife and I just got back from Africa, having spent 6 weeks in the hot and sometimes very humid air (on the coast -- the interior was dry at this time of the year). It was a wonderful trip, but very broken up as we flew between destinations hundreds of kilometres apart. The flora and fauna were wonderful (I have over 250 elephant pictures) and the SCUBA diving great. I particularly liked the people of Tanzania and Kenya, who were very friendly and liked a good joke. If there is interest, I could put on a slide show in one of our social evenings.

It was a shock, therefore to arrive back at YXS in a snowstorm! I have had one evening's observing since then with my backyard observatory (I get to stay indoors), but look forward to more -- there and out at the big observatory, once I get my internal clock reset and become fully adjusted to the cold. Brrrrr!

Anyway, here is what is happening in the skies this month:

MERCURY is an evening object all month. At month's start, it is lost in the glare of the Sun at sunset, but by mid-month, it lies only 6° above the SW horizon and sets a half hour later; it is therefore a difficult (impossible?) object. By month's end, however, it will have risen to 13° above the SW horizon at sunset and sets 1.5 hours later. At mid-month, it is a 5" disk of magnitude -0.7.

VENUS is an evening object this month. On December 1st, it lies some 22° above the SW horizon at sunset and sets almost 3.5 hours later. Then, it is a 17" gibbous disk of magnitude -4.1. By month's end, it lies 33° above the SSW sky at sunset and sets over 4 hours later! Not a lot has changed vis-a-vis the angular size and brightness, but the phase is then near half illuminated. Have a look with binoculars or a telescope, if you have one handy.

MARS, in Ophiuchus until Dec 22, after which it passes into Sagittarius, is, however, lost in the glare of the Sun this month.

JUPITER, in Sagittarius until 2009 Jan 3 (after which it passes into Capricornus), is barely visible this month at sunset. At mid-month, it lies only 12° above the SSW horizon at sunset and is a 33" disk of magnitude -2.0. It should be a tad hard to see unless you have a good southern sky.

SATURN, in Leo until 2009 (Sept), is a morning object at month' start but by the 5th, it rises at midnight (and sets at noon). It's a 18" disk of magnitude 1.0.

URANUS, in Aquarius until 2009 (March), is an evening object this month. At mid-month, it lies some 25° above the S horizon at sunset; it transits at 17:51 and sets at about 23:26. As usual, it's a 3.6" disk at about magnitude 5.7.

NEPTUNE, in Capricornus until 2010 (March), is an early evening object this month. At mid-month, it lies some 21° above the S horizon at sunset; it transits at 16:21 and sets at about 21:00. As usual, it's a 2.3" disk at about magnitude 8.0.

Winter Solstice (Summer Solstice south of the equator) occurs on December 21 at 4:04 (PST). It's first day of winter in P.G. (So we are told.)

CONSTELLATIONS to look for in December (at 21:00) are Fornax, Eastern Cetus, Western Eridanus, Aries, Triangulum and Western Perseus. This month, the description is all new.

Fornax (For, "The Furnace"), is another southern constellation with a number of faint galaxies. One of these, NGC 1201, a 1.5 x 1.0' galaxy at magnitude 11.8 – is surely a challenge object. A Google search reveals that there was a supernova of magnitude 12.5 there in 2003 Sept 9 (we must have been asleep at the time). At the southeast corner of the constellation lies the Fornax cluster of galaxies, but it is at the very limit of what we can see in Prince George. This is something to keep in mind if you take a portable telescope to Hawai'i, the southern US or someplace further south.

Eastern Cetus (Cet, "The Sea Monster"). In eastern Cetus, we see Omicron Ceti, or Mira ("The Wonderful"). Mira was the first of the long period variables discovered; maybe I'll discuss it next year again. Six or seven degrees northeast of Mira lies M77, a bright and compact spiral galaxy of 10th magnitude, also a topic for next year. Burnham's Celestial Handbook tells us that Gamma Ceti, 5 degrees west of Gamma Cet, is a nice yellow-blue double, separated by 2.7" (which should be easy for us to split). [The stars are A: 3.6 mag, Sp. A2 V; B: mag 6.2, Sp. dF3 – d stands for dwarf).] The distance to the pair is about 70 light years and the projected separation is about 60 astronomical units. However, the position angle has changed only 3° in the last century; that gives the system a period of several thousand years!! Wow! Talk about long-term studies!! Maybe every century, some unselfish astronomer

Continued: pg. 9

could do his or her duty with measurements, and way in the future someone will get a publication out of it! Will the world as we know it still exist? No one knows. That is one of the fascinating aspects of astronomy, IMHO.

Western Eridanus (Eri, "The River"). is a large constellation out of the Milky Way; the southern part (which we cannot see from Prince George) zigzags its way south to -60 degrees where the bright star Achernar (Alpha Eri) resides. I talked about the triple star system Omicron 2 Eridani, so I won't do so this year. NGC 1232, which lies at 3h 08m, -20° 46' (visible in PG) is a fine multi-armed giant spiral which lies face-on to us. It was featured on *Astronomy Picture of the Day* (available at antwrp.gsfc.nasa.gov/apod) on 2001 May 22 and 1998 Sept 30. [Many of us have APOD as our home page for our favourite internet browser.] A Google search reveals that NGC 1232 is about 100 million light years away.

Aries (Ari, "The Ram"), is the first entry in the Zodiac and is a northern constellation out of the Milky Way. Burnham's tells us that this little constellation contains two galaxies of interest – the "coarse" spiral NGC 972 (3.2' x 1.6', mag 12.2) and the irregular system NGC 1156. A Google search for the former gave me a fine technical article in the Astronomical Journal for 1998. Apparently the galaxy has a peculiar shape and a complex dust distribution. There is a massive star formation going on there (of around 2.5 solar masses per year in the central part) - - hence the detailed study. The distance is about 22 MPc = 71 million light years. The Wikipedia on-line Encyclopedia has an entry for NGC 1156. We are told that it is a dwarf irregular galaxy which contains zones of contra-rotating gas thought to be the result of tidal interactions with another gas-rich galaxy sometime in the past. [NOTE: Wikipedia, available at en.wikipedia.org, contains a fine page on astronomy – just click on 'science', then 'astronomy'. There you'll find an article of the month, a picture of the week, 'In the News', 'Did You Know?', and much more.]

Triangulum (Tri, "The Triangle"), is a small constellation just south of Andromeda and contains the famous galaxy M33 ("The Pinwheel"), discovered by Messier in August 1964. I described it last year, so I won't do so here. Another object of interest in this tiny constellation is the fine double star Iota Tri (I oughtta try – ouch!). This attractive double –- first observed by W. Hershel in 1781 -- consists of a strong yellow primary (G% III, giant star) and a pale blue secondary (F6 V, main sequence) 1.4 magnitudes fainter. It turns out that both components are double-lined spectroscopic binaries (the kind I observe in Victoria). The first has a period of 14.732 days, and the second, 2.236 days. Unfortunately, each orbital inclination is unknown (and never is, unless you have additional data). The computed distance is about 300 light years

Western Perseus (Per, "The hero that saved Andromeda"), is a northern constellation (appearing overhead at times), is in the Milky Way and contains many wonderful objects familiar to many of us. One object is Beta Persei or Algol, the most famous of the eclipsing binaries and the Double Cluster, that I talked about last year. Perseus is also the home of the "California Nebula", NGC 1499, that lies just north of Xi Per, one of the southern stars in the western leg. I can find no data on this striking nebula, other than it shines in the light of Hydrogen alpha (red) light, and is thus an excitation nebula (it fluoresces in the light of a nearby hot star). Just south of the XI Per lies Zeta Per, a B1 supergiant of magnitude 2.88. Since this star is relatively dim (for its luminosity of 6300 solar units), that tells us that it lies at great distance – and indeed it does: 1000 light years. Zeta Per is also the brightest member of the "II Per" association, an expanding group of bright O and B stars that seem to be moving outward at a velocity of 12 km/s from their common centre. Extrapolating backward tells us that the association is only about a million years old (a baby in cosmic terms!); therefore astronomers are using this association to test theories about stellar formation.

Cheers,
Bob Nelson

Free Printable Word Search Puzzles

Solar System

Find and circle all of the words that are hidden in the grid.
The words may be hidden in any direction.

U Q T U R A N U S I E G O
C S I E N K G M A R S T M
P M B G R G A V O O U N O
S V R H U E S O I L K O O
U U O G T R T L P L D L N
U M N K A Q E N U T P E N
C E N E S O R T Y S M V O
K T T P V C O X I E T T E
V E T H O H I E R P E A D
F O X M E Z D C M N U N R
G R E P J S U E A F L J G
H T R A E R U L G Y O D I
F Q D X Y L P N U S T X N

ASTEROID	METEOR	SATURN
COMET	MOON	STAR
EARTH	NEPTUNE	THE SUN
JUPITER	ORBIT	URANUS
MARS	PLANET	VENUS
MERCURY	PLUTO	

Did you enjoy this puzzle? Visit: http://www.puzzles.ca/wordsearch.html

What Happened to Comet Holmes?

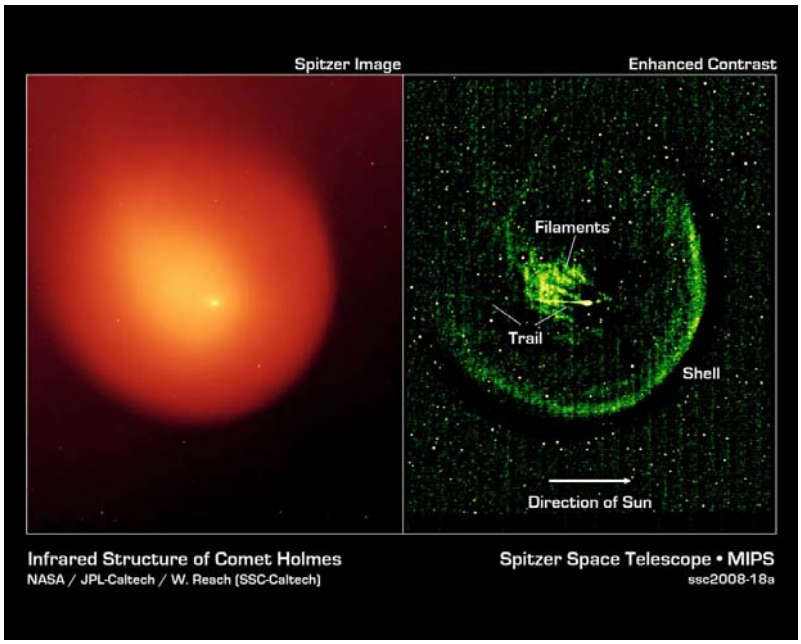
by Dr. Tony Phillips

One year after Comet 17P/Holmes shocked onlookers by exploding in the night sky, researchers are beginning to understand what happened.

"We believe that a cavern full of ice, located as much as 100 meters beneath the crust of the comet's nucleus, underwent a change of phase," says Bill Reach of NASA's Spitzer Science Center at the California Institute of Technology. "Amorphous ice turned into crystalline ice" and, in the transition, released enough heat to cause Holmes to blow its top.

Anyone watching the sky in October 2007 will remember how the comet brightened a million-fold to naked-eye visibility. It looked more like a planet than a comet—strangely spherical and utterly lacking a tail. By November 2007, the expanding dust cloud was larger than Jupiter itself, and people were noticing it from brightly-lit cities.

Knowing that infrared telescopes are particularly sensitive to the warm glow of comet dust, Reach and colleague Jeremie Vaubaillon, also of Caltech, applied for observing time on the Spitzer Space Telescope—and they got it. "We used Spitzer to observe Comet Holmes in November and again in February and March 2008," says Reach.



Comet Holmes as imaged by the multiband imaging photometer (MIPS) on the Spitzer Space Telescope. The enhanced contrast image at the right shows the comet's outer shell and mysterious filaments of dust.

The infrared glow of the expanding dust cloud told the investigators how much mass was involved and how fast the material was moving. "The energy of the blast was about 10^{14} joules and the total mass was of order 10^{10} kg." In other words, Holmes exploded like 24 kilotons of TNT and ejected 10 million metric tons of dust and gas into space.

These astonishing numbers are best explained by a subterranean cavern of phase-changing ice, Reach believes. "The mass and energy are in the right ballpark," he says, and it also explains why Comet Holmes is a "repeat exploder."

Another explosion was observed in 1892. It was a lesser blast than the 2007 event, but enough to attract the attention of American astronomer Edwin Holmes, who discovered the comet when it suddenly brightened. Two explosions (1892, 2007) would require two caverns. That's no problem because comets are notoriously porous and lumpy. In fact, there are probably more than two caverns, which would mean Comet Holmes is poised to explode again.

When?

"The astronomer who can answer that question will be famous!" laughs Vaubaillon.

"No one knows what triggered the phase change," says Reach. He speculates that maybe a comet-quake sent seismic waves echoing through the comet's caverns, compressing the ice and changing its form. Or a meteoroid might have penetrated the comet's crust and set events in motion that way. "It's still a mystery."

But not as much as it used to be.

See more Spitzer images of comets and other heavenly objects at www.spitzer.caltech.edu. Kids and grownups can challenge their spatial reasoning powers by solving Spitzer infrared "Slyder" puzzles at http://spaceplace.nasa.gov/en/kids/spitzer/slyder.

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