



# PeGASus

Newsletter of the

Royal Astronomical Society of Canada: Prince George Centre

Published: January to May & September to November.

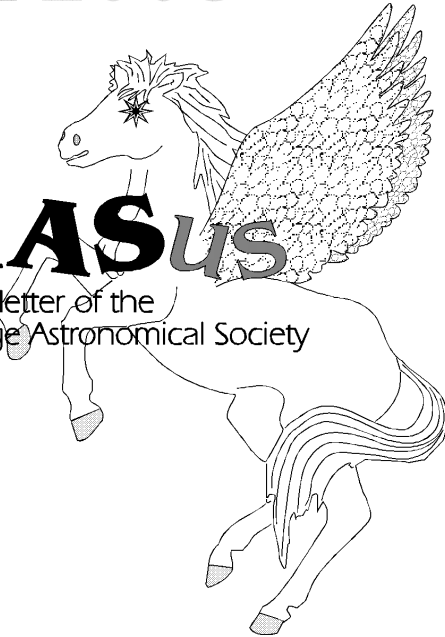
[www/rasc.ca/princegeorge](http://www/rasc.ca/princegeorge)

## April 2008

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

# PeGASus

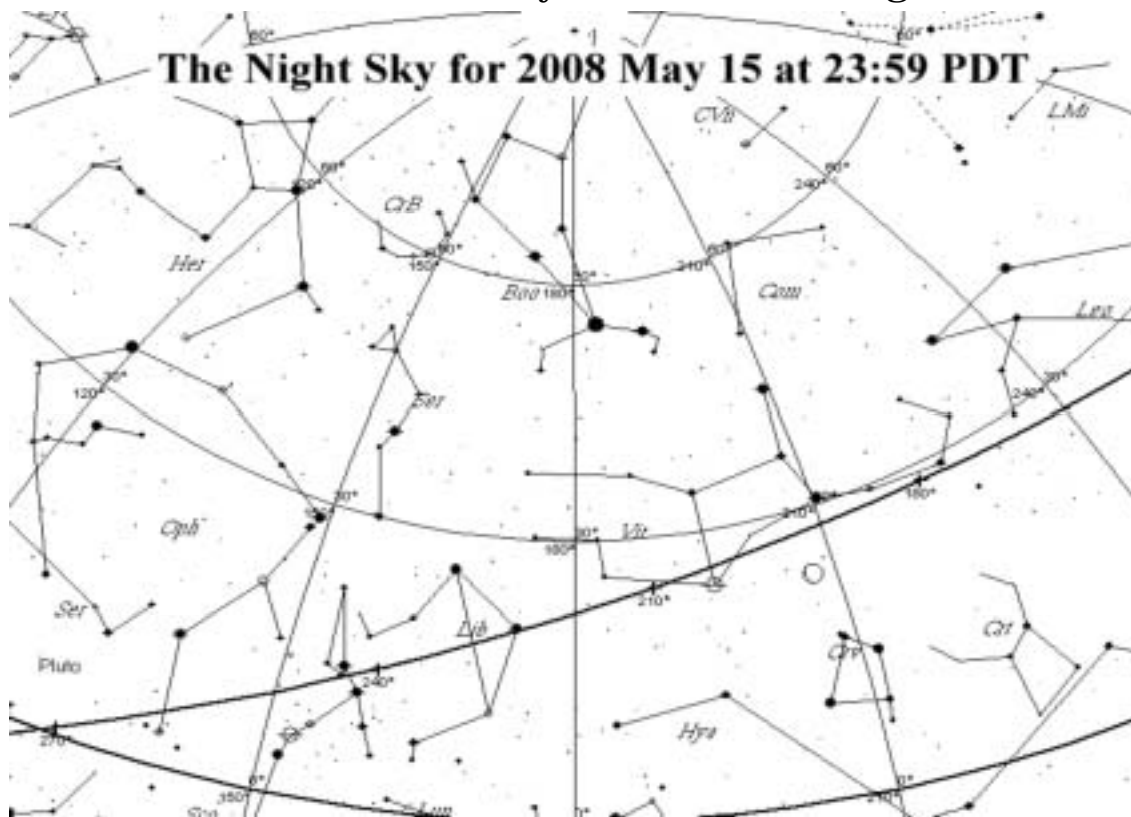
Newsletter of the  
The Prince George Astronomical Society



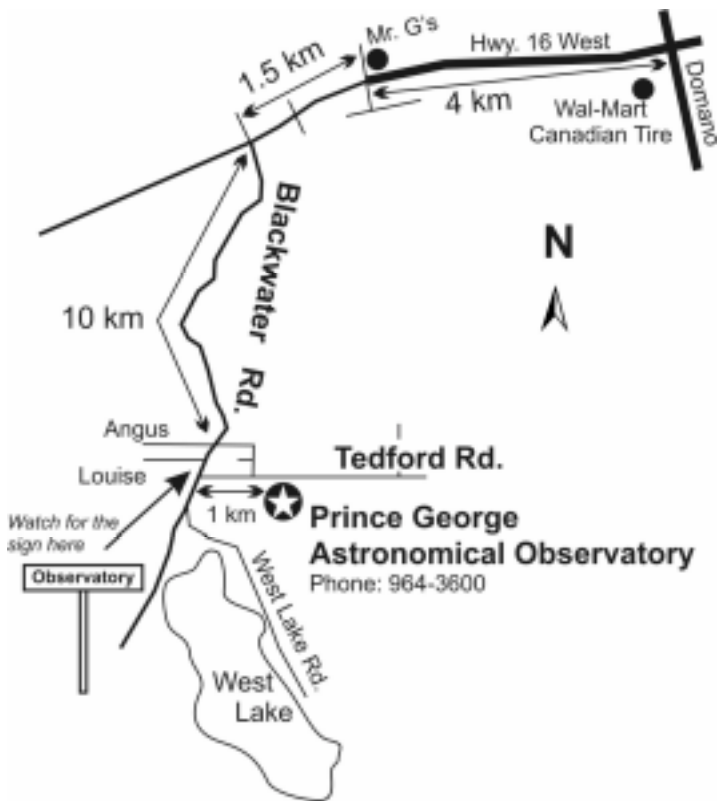
## In Issue # 167

P.G. Centre Executive	2
Coming Events	2
Editorial	3
News, News, News	3
The Night Sky	5
Photo Gallery	7
Lunar Eclipse & Spy Sat .	8
Stellar Compass	10
USA 193 Shoot Down Emails	11
USA 193 Satellite Shoot Down	12
Star Hopping in Virgo	13
Calgary Centre: Star-B-Q	14
Join the P.G. Centre	15

The RASC: Prince George Centre meets next,  
Saturday April 26, 7:30 pm  
at the Observatory for a Social Evening



South



Send correspondence to  
**RASC: Prince George Centre**  
**7365 Tedford Road**  
**Prince George B.C.**  
**V2N 6S2**

Phone: 964-3600

**RASCPG**  
*Executive, 2007 / 2008*

**President**

Gil Self  
 964-7279  
 selfpg@telus.net

**National Council Rep.**

Brian Battersby  
 612-4623  
 brianbattersby73@yahoo.ca

**Vice President**

Maurice Sluka  
 563-3337  
 msluka@telus.net

**Members at Large**

Jim Arnold  
 John Ascah  
 Hugh Kennedy  
 Gregory Mohammed  
 Trevor Padgett  
 Jim Toews  
 Doug Wayland  
 Blair Stunder

**Secretary**

Glen Harris  
 562-4488  
 g\_harris@telus.net

**Treasurer**

Bob Nelson  
 563-6928  
 bob.nelson@shaw.ca

**Past President**

Brian Battersby

Contributions to the newsletter are welcome.

**Deadline for the next issue is**

**May 20, 2008**

**PeGASus Editor**

**Brian Battersby**

brianbattersby73@yahoo.ca

**Coming Events**

*To Volunteer to help run an event please contact Brian Battersby.*

*brianbattersby73@yahoo.ca*

*Phone: 561-8138 (day) 612-4623 (evening)*

<i>Date</i>	<i>Event</i>	<i>Time</i>	<i>Place</i>	<i>Volunteers</i>
April 25	Open House	8:00 pm	Observatory	Blair S, Paul S
April 26	Social Meeting	7:30 pm	Observatory	Gil S
May 2	Open House	8:30 pm	Observatory	Bob N, Blair S
May 3	NOVA Class 8: Stars	7:00 pm	Observatory	Greg M, Brian B
May 9	Open House	8:30 pm	Observatory	*HELP*
May 10	Astronomy Day—Solar Viewing	12:00 - 4:00 pm	Pine Centre Mall	Blair S, Brian B
May 16	Open House	8:30 pm	Observatory	Bob N, *HELP*
May 17	NOVA Class 9: Observatory Op.	7:00 pm	Observatory	Brian B
May 23	Open House	8:30 pm	Observatory	*HELP*
May 24	Tour: Girl Guides (large group, 70+)	9:30 pm	Observatory	Brian B, Glen H, Bob N, *HELP*
May 30	Open House	8:30 pm	Observatory	Bob N, *HELP*
May 31	Year End Barbeque Social	6:00 pm	Observatory	Gils S, <i>everyone!</i>

*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 woke up the other morning thinking about “stuff”. Stars, planets, rocks, animals, insects, fish, birds, dirt, paper, desks, chairs, computers.... all of that “stuff”.

I came to the conclusion that I am made up of the same “stuff” as everything else in our perceived universe that we can see, touch and feel. Most people call this “stuff” matter. It is made up of quarks, protons, neutrons, electrons... atoms.

Atoms make up matter as we know it in our everyday life.

The thought I then had was “Why are the atoms that make up me “alive” while the atoms that make up that desk over there are not?”

Why is that? What is so special about “my” atoms? Not a thing. I’m sure “my” atoms are just as cool as “your” atoms or the chairs or rocks atoms.

And yet we humans seem to think our atoms are much more special than the rocks or the insects or the planets.

Our atoms “walk and talk” we think. Aren’t they just “oh, so” special!?

Does that seem illogical to anyone else? Is it just me?

They teach this stuff in grade four for crying out loud. Why doesn’t this hit us then? Why aren’t all of the grade four kids running around saying..... “Holy crap! I am the same as everything else! I am the same as that rock, I am the same as my desk, I am the same as you?”

“I” = matter.

I am the same as everything and everything is the same as me.

If that is true then isn’t “everything” alive? Isn’t “everything” just as important (or unimportant) as me?

Then along comes “dark matter”. What is it? Matter we can not yet perceive.

Current thinking says there is more “dark matter” than our “normal” matter in the universe. Normal matter (stars, planets, rocks, animals, insects, fish, birds, dirt, paper, desks, chairs, computers) is in the minority.

I hope “dark” matter is friendlier than “normal” matter.

## P.G. Centre News

Astronomy Day is Saturday, May 10th. Join us at Pine Centre Mall from noon to 4:00pm. SE side of lot.

\*\*\*

The Prince George Centre Annual Year End Barbeque will be held on May 31 at 6:00 pm.

\*\*\*

Observatory roof repairs are set for sometime during the week of June 17th to 24th. If you can help remove and replace damaged sections contact Maurice Sluka at [msluka@telus.net](mailto:msluka@telus.net) or 563-3337.

\*\*\*

On April 2, 2008 the local TV program Quizme shot several video questions for it’s Jeopardy style kids program on location at the observatory. Hopefully, this free advertising will help increase awareness of the observatory in the community.

\*\*\*

Wayne Sanders is putting the finishing touches on his Astronomy teaching CD-Rom.

\*\*\*

On behalf of the Calgary Centre, Royal Astronomical Society of Canada you are invited to attend the:

### **Alberta Star Party**

September 25-28, 2008

Starland Recreation Area Campground

David Brown (403)-246 4498, email:

[ASP2008@shaw.ca](mailto:ASP2008@shaw.ca)

[www.calgary.rasc.ca/asp2008.htm](http://www.calgary.rasc.ca/asp2008.htm)

## RASC eNews

2008 GA

### **Award Winners to be Honoured at General Assembly**

A full slate of RASC awards will be presented at the 2008 General Assembly. A schedule for the Awards presentation is now available.

Apr 20, 2008, 09:06

*Continued: pg. 4*

*Across the RASC*

### **NO GO for RASC NEAF Excursion**

The Toronto Centre has had to cancel their planned excursion to the Northeast Astronomy Forum from April 25-28th.

Apr 17, 2008, 15:13

*Announcements*

### **Asteroid 8736**

Asteroid 8736 named for Osao Shigehisa, RASC life member.

Apr 16, 2008, 14:02

*Astronomy Outreach*

### **Public Outreach Now on the Web Too!**

The traditionally public outreach program of RASC Centres involves dedicated members setting up telescopes for the public to enjoy many celestial wonders. Gary Boyle of the Ottawa Centre and monthly columnist for the "Sky This Month" has taken public outreach one step further – he has gone global via the World Wide Web.

Apr 15, 2008, 14:16

*Announcements*

### **New President of the RASC announced**

The Executive Committee and BPC have appointed a new RASC President.

Apr 14, 2008, 13:12

*2008 GA*

### **Paper Registration Forms Now Available for GA**

Paper registration forms are now available for download from the 2008 General Assembly registration page at [www.rasc.ca/ga2008/register.shtml](http://www.rasc.ca/ga2008/register.shtml).

Apr 12, 2008, 23:08

*Astronomy Outreach*

### **Skyways Addendum and Errata Released**

A new Addendum and Errata tip sheet has been published to assist educators who use the Society's *Skyways* Astronomy Handbook for Teachers. This document includes over 50 changed and improved web links to assist teachers with lesson planning along with a few errata identified since the first edition. Thanks to Blake Nancarrow of the Toronto Centre who assisted with the research on this document.

Apr 12, 2008, 08:57

*Announcements*

### **RASC President, Scott Young, Resigns**

Scott Young, RASC President has resigned effective Saturday, 2008 April 5.

Apr 9, 2008, 11:40

*Across the RASC*

### **Earth Hour Event Attracts 2,000 to See the Stars in Toronto**

The Toronto Centre had an "outstanding" event as part of Earth Hour on March 29, 2008 with 40 volunteers, 25 telescopes and over 2,000 participants! Telescope line-ups were busy and the weather was just outstanding with mild temperatures and a very clear sky.

Apr 3, 2008, 10:58

*Northern Skies*

The Sky This Month - April 2008

With hundreds of galaxies located in the constellation Virgo, it is easy to see how we are a mere tear drop, in the ocean of the Universe.

Apr 3, 2008, 00:47

*Announcements*

### **Sunshine Coast Celebrates Earth Hour on the Eve of Becoming RASC's 29th Centre!**

The Executive Committee is pleased to welcome the Sunshine Coast Centre (SCC) to the RASC family! SCC by-laws were approved in principle by National Council, amended as required and received final executive approval on 30 March 2008.

Mar 31, 2008, 14:26

*National Council*

### **Flash Minutes from NC081 now on-line!**

Flash minutes from National Council Meeting NC081, 2008 March 30 are now available in the Members' section of the website.

Mar 30, 2008, 21:25

*Announcements*

### **Help Study the Impact of Earth Hour!**

Earth Hour is on March 29, 2008. Everyone is asked that they shut off their lights and all nonessential electrical appliances to help out with greenhouse gas emissions, from 8:00 pm to 9:00 pm. Members and friends of the RASC can also take advantage of this opportunity to do some Light Pollution Studies during this unique event.

Mar 25, 2008, 18:16

*Across the RASC*

### **Star Watch for Earth Hour March 29th**

To help celebrate Earth Hour and Astronomy come and join thousands of people to view and measure the night sky of stars and light pollution on March 29, 2008 from 8:45 to 9:15 pm .

Mar 24, 2008, 16:51

# The Night Sky for May 2008

by Bob Nelson, PhD

**H**i Folks,

As I write this, I am in the dome of the 72" telescope ("The Plaskett") at the DAO in Victoria for my semi-annual observing run. (I take spectra to get radial velocities of eclipsing binaries that I study.) The exquisite sounds of Beethoven's Violin Concerto are on National Public Radio from Port Angeles. It is about 21:30 (PDT) and it is cloudy (I think – I have no desire to leave the dome at the moment!). I have no cause to complain, however – the last four nights have been clear (or partially so) and there is a chance that it will clear up later. Although there have been some hardware and software glitches over the past few nights, there are staff members that you can call at any time of the night if it's clear and you can't get data.

For example, last night the upper wind curtain got stuck in the lowered position (I need it to shield the telescope from the wind – else the star image on the slit jumps around wildly with very little getting to the detector). We solved this by various tricks (like moving the dome to shake things up). Today, Dmitry – the resident observer and technician – then took the upper curtain out of operation. A couple of nights before, the imaging (Linux) computer locked up; I had to learn how to reboot it and start everything up again. And so it happens that one needs a real bag of tricks to solve problems. (For example, I know how to kick the drive system should it misbehave.) One gets better at this kind of thing with experience.

*I expect that our 24" telescope with the new drive will be no different.* It is our job, of course to run the new setup through its paces, solving all the problems we can and documenting those that we can't (with workarounds as necessary). In time, we should eventually be able to get a smoothly-running telescope. In the meantime, I would suggest that everyone will need to be patient, as these problems are common with many telescopes, in my experience.

I have been getting some good data and hope to finish up some stars. I have colleagues in Turkey (and now China, I believe) that want the data, and will do the analysis, write the paper and publish with my name listed as one of the authors. It sounds like a good deal to me. Bring on the clear skies!

Anyway, here is what is happening in the sky next month:

MERCURY is an evening object all month. At month's start, it is a 6" disk of magnitude -0.9, 74% illuminated (gibbous phase), and lying at 16° eastern elongation (from the Sun). At mid-month, these figures have progressed to 7", -0.2, 34%, and 22° respectively, and by month's end to 12", 3.6, 4% (crescent phase), and 10°. So Mercury becomes closer, larger, and dimmer (because its disk is progressively less illuminated). Curiously, the date of greatest eastern elongation (GEE) is May 14, when it will be only 36% illuminated. Normally, one would expect an inferior planet to be at GEE when it is 50% illuminated (like the Moon at first quarter). However, the discrepancy is undoubtedly due to the elliptical nature of Mercury's orbit (and to some extent of the Earth's). Mercury is certainly worthy of observation, because this is a favourable apparition for northern observers.

VENUS is a morning object in May. At month's start, although it is 10° west of the Sun, it rises only 8 minutes before sunrise. (The reason for this is the usual – the inclination of the ecliptic to the celestial equator. This month the inclination is such that the Sun-Venus line is only 5° above the horizon, therefore the rise times are almost identical.) Venus, racing ahead of Earth in its orbit as it always does, gets closer and closer to the Sun this month and next, reaching superior conjunction (behind the Sun) on June 9. After that, it's an evening object (yeah!).

MARS, in Gemini until May 5, after which it passes into Cancer, is an evening object in May. At mid-month, it lies about 42° above the WSW horizon at sunset, and sets itself some 5 hours later (at 02:12 PDT). It's slowly shrinking in size (only 5" now) as Earth zooms away from it. At magnitude 1.4, it is 1.76 astronomical units (263 million kilometres) away, and will be in the gibbous phase, almost full.

JUPITER, in Sagittarius until 2009 (Jan), is a morning object in May. At mid-month, it rises at about 01:20 (PDT) and, at sunrise, it is located right on the meridian, but only a paltry 14° above the horizon.

*Continued: pg. 6*

SATURN, in Leo until 2009 (Sept), is an evening object in May. At sunset, it lies a whopping 48° above the SSW horizon, sets at around 03:00 (PDT), and is therefore well placed for observation. At magnitude 0.6, it is a 19" disk with rings at inclination (to the plane of the sky) 80° (or 10° from edge-on). As usual, it's a glorious site, together with its moons, and is well worth observing.

URANUS, in Aquarius until 2009 (March), is a morning object in May. At mid-month, it rises about 1 ½ hours before the Sun, and at sunrise, it lies some 14° above the ESE horizon. As usual, it's a 3.6" disk at about magnitude 5.7.

NEPTUNE, in Capricornus until 2010 (March), is a morning object in May. At mid-month, it rises about 2 ½ hours before the Sun, and at sunrise it is some 16° above the SE horizon. As usual, it's a 2.3" disk at about magnitude 8.0.

CONSTELLATIONS to look for in May (at 23:00 PDT) are Eastern Hydra, Corvus, Virgo, Coma Berenices, Bootes and Canes Venetici.

Corvus ("The Crow") is the small lectern-shaped constellation southeast of Leo (the top two stars point up and left towards Spica to the northeast). It contains NGC 4782, a galaxy located halfway towards Spica and NGC 4361, a planetary nebula inside the figure. Messier 104 is just over the north boundary in Virgo. It also contains NGC 4038 - the "Ring-Tail Galaxy" about 3.7° WSW from Gamma Corvi. (Follow the top two pointer stars for about the same distance down and to the right.) According to Burnham's *Celestial Handbook*, it's *sometimes* regarded as a gravitationally interacting (or actually colliding) pair of galaxies. (Today, I think there's no doubt that they are colliding galaxies.) Deep images (and RealSky does a good job) show a kidney-shaped object with two curved tails extending north and south. Radial velocity measurements show that the system lies about 90 million light years distant, giving it a diameter of 100,000 light years and total luminosity of 20 billion suns. There is also another galaxy (NGC 4027) lying 0.7 degrees away that is "almost certainly" gravitationally linked. This should be an easy target, next time you are out at the observatory.

Hydra ("The Sea Serpent") is a sprawling constellation running from 8 hours to 15 hours right ascension and from -35 to +5 degrees declination. In this

month's region of interest, there is globular cluster M68, lying 3.8 degrees southeast of Beta Corvi (the star at the lower left corner of Corvus), and several galaxies, M83, NGCs 5061, 3923, and 3821. M83 is a large spiral galaxy discovered by Lacille in 1752; it is one of the brightest galaxies in the southern sky, with two strongly swirling arms, in a reversed 'S' (there is also a third arm). The distance appears to be well-determined – about 10 million light years. M83 appears to have had a remarkable number of supernovae in the last 100 years (1923, 1950, 1957, 1968 and I don't know after that, because Burnham's – my principal reference – is dated 1978). We are told that the average production rate is about one per 300 years for a given galaxy. It also contains NGC 5694, one of the more remote globular clusters that are still part of our galaxy. It lies at the eastern end of the "tail". It was discovered by Sir William Herschel in 1784, recognized as a globular by Clyde Tombaugh and friend at Lowell Observatory in 1932.

Virgo ("The Virgin") and Coma Berenices ("Bernice's Hair"), lying to the east of Leo, are the regions of the sky rich in galaxies. Virgo contains 11 Messier objects, all galaxies and many NGC objects too numerous to mention. These are part of the giant Virgo cluster of galaxies lying some 20 megaparsecs (65 million light years) from Earth and is some 500 million light years in diameter. It contains some 1000 galaxies and shines with the light of 10<sup>14</sup> suns. It is thought that the local group (containing the Milky Way Galaxy, M31, M33 and others) may be falling towards the Virgo Cluster. Nearby in the sky, but much more distant is the even larger Coma cluster which lies some 150 megaparsecs (500 million light years) away. It contains some 10,000 galaxies and shines with the light of 10<sup>15</sup> suns. There is a similar cluster in Corona Borealis, about 700 million years distant.

Also in western Coma Berenices lie the globular clusters M53 and NGC 5053, about 1 degree apart. In Canes Venatici, about 15 degrees to the northeast, lies M3, one of the three finest globular clusters in the northern sky, (the others are M13 and M5). Discovered by Messier in 1764, it glows with the apparent magnitude of a 6th magnitude star and lies about 35,000 light years distant.

Clear skies,  
Bob Nelson

# Photo Gallery



*left:*  
**Keith Egger—  
RASC P.G.**

This is (yet another) photo of M42, but it's my first with my new Meade LX75 SN8 telescope and DSI III color camera. It is 50 images exposed for 11.2 seconds each stacked using the Meade Envisage software that comes with the camera then post-processed in Photoshop CS2.

Taken Feb 24, 2008 at 21:00 PST. I think it's pretty good for a first try with the new setup!

I especially like the halos around the bright stars centre-left where their solar wind has carved out a hole in the gas cloud.



*above left:* **Bob Nelson— M51 (Whirlpool Galaxy).**

A 70 minute picture of M51: 10 min clear, 10 min R, 20 min V (green), and 30 min B. After suitable processing (removing excess background, clearing away cosmic ray traces, registering and summing each colour, rotating and registering the 4 colours), I combined the 4 images to produce this colour image. It's not the greatest image of this galaxy, but one that I am happy with since it represents my best to date. BTW, almost all frames were 2 minutes unguided. Seeing was fair to good at 2.6" and the atmosphere very clear (for these parts).



*above right:* **Doug Wayland—Horsehead Nebula.**

Taken with a 35mm Canon FTb at prime focus of LX10 with f6.3 focal reducer. It was a manually guided 40 minute exposure on Kodak Elitechrome 200.

Taken Feb 26, 2005

# Dramatic Night, Dramatic Sky

## Lunar Eclipse & Spy Satellite USA193 debris Feb. 20, 2008

by Maurice Sluka

On February 20<sup>th</sup> the observatory had a special Open House for the Total Lunar eclipse. It was a magical evening for more than one reason. The attendance was over 8 members and few dozen of the public. The evening was off to a slow start with some cloud to the east obstructing the moon for the first half of the penumbra shadow.

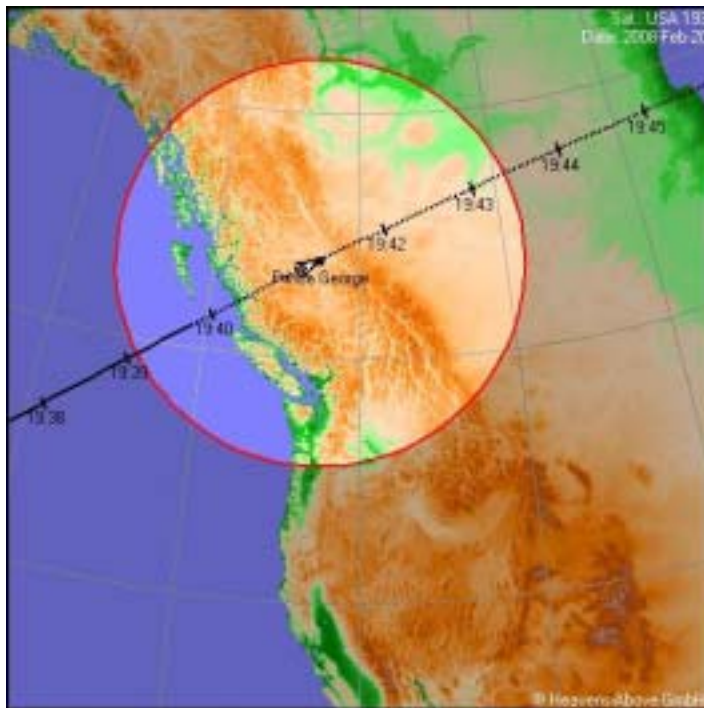
Around 19:00 the cloud was starting to clear and we had some good views of the moon passing in and out of clouds. As the umbra shadow started the moon took on an amber colour and then a burnt red-orange colour.

We had some discussion in the days' prior, but we did not expect what happened next. At the peak of the umbra shadow, at 19:40, there were exclamations 'What is that – WOW'. Out of the southwest we witnessed the following:

- 8 main objects were observed out of the southwest, travelling directly overhead and into the northeast. With smaller objects travelling with the larger pieces.
- These 8 objects were on a parallel course, covering an area of sky approximately 40 degrees wide between the north star, Polaris, and the eclipsed moon to the southeast.
- Each of these objects had a yellow-gold flare like glow at the leading edge, and leaving a glowing yellow tail lasting over a minute each.
- The majority of these objects were all entering the atmosphere at the same time, with the largest almost in a line, side by side.

This was the re-entry of the debris of USA Spy Satellite 193. It was an amazing sight; none of us were prepared of such an amazing display. We could not have been better located to see the debris. I also think we were first to see the debris after the collision, since it was less than 13 minutes after the missile was launched, and the interception was nearly 10 minutes before we sighted the debris. It may have been possible to see debris on the coast, but the weather may have interfered.

Here is the course of re-entry USA Spy Satellite 193 also known as NRO launch 21 (NROL-21) or simply L-21.



What NROL-21 may have looked like, its weight may have been up to 2300kg and 5 x 2 meters in size.

The highlighted circle is the region where the satellite is at least 10° above your horizon. The size of the circle depends on the height of the satellite. The solid part of orbit shows where the satellite is sunlit, and the dashed part where it is in the Earth's shadow and invisible.

19:39:00	10	WSW	19:41:15	84	NNW	19:43:28	10	ENE
----------	----	-----	----------	----	-----	----------	----	-----

Start ALT AZ Middle ALT AZ End ALT AZ

*Continued page 8*



According to Wikipedia the USA Navy's USS Lake Erie (CG-70) launched a RIM-161 Standard Missile (SM-3) surface to air missile on February 21<sup>st</sup> 2008 at 3:26 am (UTC) or 7:26PM Pacific time (UTC-8 hours). and hit USA-193 at an altitude of 247 km above the pacific ocean, west of Hawaii and speed of 36,667 km/h according to a Pentagon statement. The SM-3 has a maximum reported range of 500km and altitude of 250km

the next forty days, with most of the satellite's mass re-entering the atmosphere within the first 24 to 48 hours after the missile strike.

The media attention was amazing. We received messages from across Canada. The RASC Prince George Centre observatory had its 15 minutes of fame! We even had a radio interview with a Mr. Colin Maybury's program 'The Starlight Zone' on station 2NUR FM in Newcastle Australia. Colin investigated the orbit of USA193 and contacted us a few days prior to the shoot down when he realized the satellite may come down within sight of Prince George. He was right on the button. Here is an address link to listen to the radio interview:

<http://www.newcastle.edu.au/service/2nur/programs/starlight.html>

One may wonder if the timing of the missile launch was because of the total lunar eclipse, since the United States of America would have plenty of witnesses of the attempt or if the eclipsed moon helped with the targeting.

The sky continued to clear as the moon crept out of the umbra and penumbra shadows. The moon looked unusual, with a shadow in a strange spot, yet bright and clear and lots of detail where the earth's shadow traversed the surface.

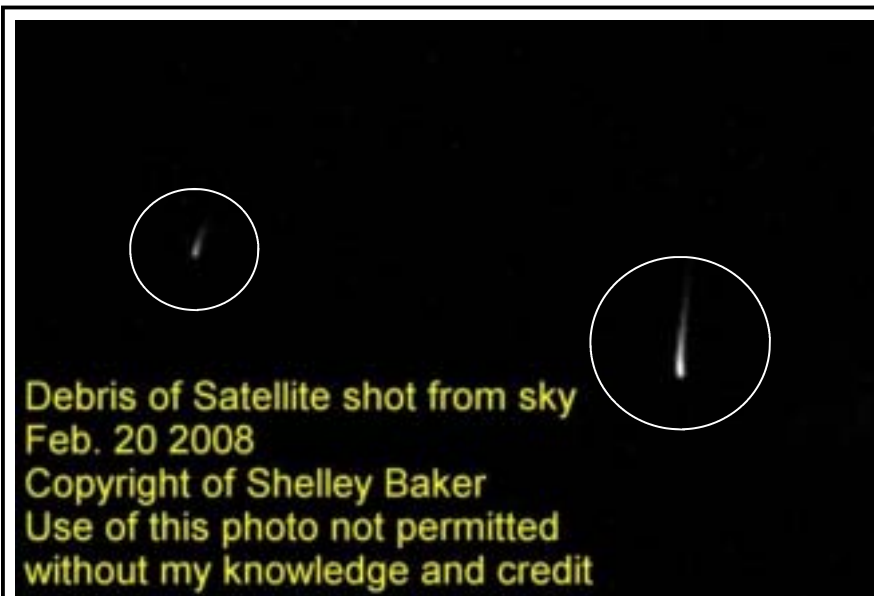
At any rate it was an amazing sight, one I will never forget, and was happy to share with friends there.

*Maurice*



Launch time of the interceptor:  
03:26:47.5 21 Feb 2008 UTC  
Launch position of the interceptor:  
23.482 N, 163.282 W  
Approximate time of intercept:  
03:29:37  
Approximate position of intercept:  
21.15 N, 163.76 W, and 249km altitude

The Department of Defense said it has a "high degree of confidence" that the fuel tank was hit and destroyed, but has not yet confirmed it. The satellite's remnants are expected to burn up over the course of



Here is the only photo of the re-entry particles that I have learned of, by Shelley Baker outside Chetwynd BC.

***Editors Note:***

In addition to the interviews Maurice conducted I also conducted interviews with:  
CBC The National  
PGTV News  
CBC Radio (several different shows)  
The Globe & Mail  
MSNBC

And the initial report made to the RASCals list has appeared on many websites including Space.com

The RASC Prince George Centre did indeed get its 15 minutes of fame!

# Stellar Compass For Space Explorers

by Patrick L. Barry

In space, there's no up or down, north or south, east or west. So how can robotic spacecraft know which way they're facing when they fire their thrusters, or when they try to beam scientific data back to Earth?

Without the familiar compass points of Earth's magnetic poles, spacecraft use stars and gyros to know their orientation. Thanks to a recently completed test flight, future spacecraft will be able to do so using only an ultra-low-power camera and three silicon wafers as small as your pinky fingernail.

"The wafers are actually very tiny gyros," explains Artur Chmielewski, project manager at JPL for Space Technology 6 (ST6), a part of NASA's New Millennium Program.

Traditional gyros use spinning wheels to detect changes in pitch, yaw, and roll—the three axes of rotation. For ST6's Inertial Stellar Compass, the three gyros instead consist of silicon wafers that resemble microchips. Rotating the wafers distorts microscopic structures on the surfaces of these wafers in a way that generates electric signals. The compass uses these signals—along with images of star positions taken by the camera—to measure rotation.

Because the Inertial Stellar Compass (ISC) is based on this new, radically different technology, NASA needed to flight-test it before using it in important missions. That test flight reached completion in December 2007 after about a year in orbit aboard the Air

Force's TacSat-2 satellite.

"It just performed beautifully," Chmielewski says. "The data checked out really well." The engineers had hoped that ISC would measure the spacecraft's rotation with an accuracy of 0.1 degrees. In the flight tests, ISC surpassed this goal, measuring rotation to within about 0.05 degrees.

That success paves the way for using ISC to reduce the cost of future science missions. When launching probes into space, weight equals money. "If you're paying a million dollars per kilogram to send your spacecraft to Mars, you care a lot about weight," Chmielewski says. At less than 3 kilograms, ISC weighs about one-fifth as much as traditional stellar compasses. It also uses about one-tenth as much

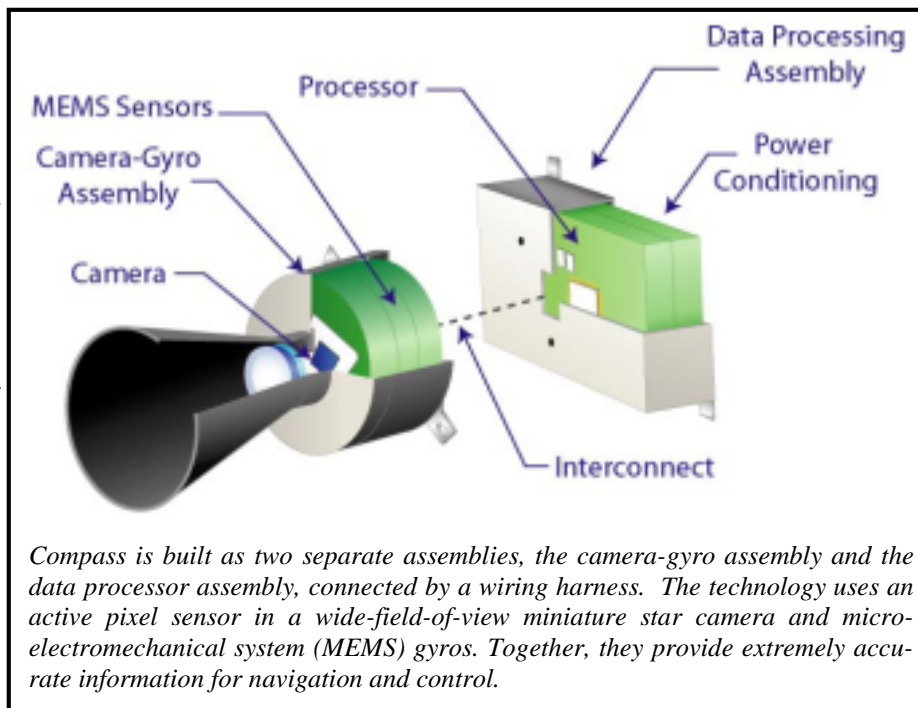
power, so a spacecraft would be able to use smaller, lighter solar panels.

Engineers at Draper Laboratory, the Cambridge, Massachusetts, company that built the ISC, are already at work on a next-generation design that will improve the compass's accuracy ten-fold, Chmielewski says. So ISC and its suc-

cessors could soon help costs—and spacecraft—stay on target.

Find out more about the ISC at [nmp.nasa.gov/st6](http://nmp.nasa.gov/st6). Kids can do a fun project and get an introduction to navigating by the stars at [spaceplace.nasa.gov/en/kids/st6starfinder/st6starfinder.shtml](http://spaceplace.nasa.gov/en/kids/st6starfinder/st6starfinder.shtml).

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



*Compass is built as two separate assemblies, the camera-gyro assembly and the data processor assembly, connected by a wiring harness. The technology uses an active pixel sensor in a wide-field-of-view miniature star camera and micro-electromechanical system (MEMS) gyros. Together, they provide extremely accurate information for navigation and control.*

## RASC Prince George Centre Emails following USA 193 Shoot Down

---

**SENT:** Thu, 21 Feb 2008 00:05:55 -0500 (EST)  
**SUBJECT:** [RASCals] LUNAR ECLIPSE AND  
USA 193 SHOOTDOWN

---

At approx. 19:43 PDT while observing the lunar eclipse at the PGO (53° 45' 29" N 122° 50' 56" W) a group of about 30 people, PG Centre members and public, witnessed what we assume was the demise of the spy satellite USA 193.

Many debris trails were witnessed moving from south-west to north-east at high altitude. One was especially bright and long lasting. I can recall about 6 bright trails and 15 fainter ones.

The debris trails seemed to come in "waves" with the first wave being brighter than the debris that followed behind it. The trails seemed to be in a fan shape with the trails being wider apart in the north-east than they were in the south-east.

The event was the highlight of the evening as we had only a mediocre view of the lunar eclipse due to a patchy blanket of clouds low in the east.

*Brian Battersby*  
*Prince George Centre*

---

**SENT:** Thursday, February 21, 2008 7:25 AM  
**SUBJECT:** SATELLITE RE-ENTRY

---

Hi Doug,

I am going to do an interview with CBC at 8:00 on the satellite re-entry. The time was 19:38.

I believe you said the satellite was due over us at 19:38; the debris was on time, correct?

If you have any other information, please let me know.

I will report the following:

- At 19:38 pacific time, at least 8 objects were observed out of the southwest.
- These 8 objects were on a parallel course, covering an area of sky of approximately 40 degrees between North Star Polaris and eclipsed moon the southeast.
- Each of these objects left a yellow-gold flare like glow, each with a glowing tail lasting over a minute. The majority of these objects were all entering the atmosphere at the same time, with the largest almost in a line, side by side.

*Maurice Sluka*

---

**SENT:** Thu, 21 Feb 2008 07:34:21 -0800  
**SUBJECT:** Re: SATELLITE RE-ENTRY

---

Hi Maurice,

the time was actually about 19:40. Yes it was close to the predicted time of passage over our area. The debris field was travelling from WSW to ENE. Almost directly overhead.

*Doug Wayland*

---

**SENT:** Thu, 21 Feb 2008 15:36:56 -0800 (PST)  
**SUBJECT:** DID YOU SEE IT?

---

Hello, Brian. I was out in the dark (literally, during totality) about 8 km NW of Vanderhoof, observing the eclipse, which, by the way, was better than average. During totality I was glassing everything else since it got nice and dark, milky way was impressive, too. (equipment used was tripod-mounted 15X63s, and a pair of 8X56s for free-hand work).

But to the point: Totally by accident, I happened to spot what I took to be a satellite re-entry coming out the west, I managed to track it in my binos since I had them in my hand. How often does a guy get to do that? When I spotted it its approximate location was western Andromeda, it headed E-NE through Cassiopeia, broke into three pieces and winked out somewhere below Polaris. A grand total of at least 50 deg. of travel. Immediately after I turned on the ignition in my pick-up and checked the clock, it read 7:43pm.

I'm wondering who else saw it and did I diagnose it correctly? Note that it moved slow enough (barely) that I managed to follow it with my binos and wasn't bright enough to be a fireball, either.

If you get a chance, please reply.

Thanks,  
*Pete Sipponen*

---

**SENT:** Saturday, Feb 23, 2008  
**SUBJECT:** MORE FRAGEMENTS

---

I was setting my telescope up in the back yard and at 23:13 I saw another satellite fragment hit the atmosphere. It was brighter and larger than any on Wednesday night and glowed very orange from the zenith to about 10 degrees above the southern horizon.

*Glen Harris*

# P. G. Centre Spots Debris from USA 193 Shoot Down

by Paul Strickland, Prince George Citizen

The fragments of USA Spy Satellite 193 streaking across the night sky provided a spectacular show Wednesday for visitors to the Prince George Astronomical Observatory viewing the lunar eclipse.

The objects came out the southwest sky, went overhead and then moved into the northeast, said Maurice Sluka, vice-president of the Royal Astronomical Society of Canada-Prince George Centre.

"There were at least eight objects, all on a parallel course -- each with a very bright yellow-gold flare light," he said. "Each also trailed a luminescent yellow tail that would last over one minute.

"These objects, when they were overhead, were spanning as widely as 40 degrees wide between the North Star, Polaris, and an area above the eclipsing moon in the eastern sky."

These fragments were going across the sky in a loosely aligned group heading northeast, he said.

A couple of the fragments burned up before they made it that far, said Glen Harris, secretary of the RASC-Prince George Centre. "Others disappeared into clouds as they headed toward the horizon," he said Thursday.

Sluka checked with Heavens Above, an astronomy website, which forecast the spy satellite would cross above northern B.C. Wednesday at 7:39 p.m. "That was within a minute of when we saw it," Sluka said.

The website said the satellite would be overhead at 7:41 p.m. and would disappear into the northeast 7:43 p.m.

Sluka also found information that the missile aimed at the satellite was launched at 7:25 Pacific Standard Time. "That was less than 15 minutes between the launch and our seeing it after it had been hit by the missile," Sluka said. "The impact was not visible from our location."

"All the circumstantial evidence -- from where the satellite was forecast to go overhead and the time it was expected to appear in the southwest and where we did see the debris -- shows those fragments should have been from that satellite," he said. "They would-

n't match a meteor shower," Sluka said. "Meteors from meteor showers are far more random in appearance and timing.

"What we had was a group of bright objects on a parallel course."

"It was a spectacular visual display," Harris agreed.

About 40 people visited the observatory on Tedford Road to observe the total eclipse of the moon. Clouds in the east interfered with the view of the moon during much of the time that it was fully eclipsed. However, breaks in the cloud cover allowed brief glimpses of excellent sharp images of its darkened surface through large telescopes astronomers had set up on observatory grounds for the visitors.

Cloud cover remained intermittent and light enough between 7:45 and 8:45 p.m. that visitors also enjoyed a good continuing view of a returning area of brightness growing from below as the moon moved out of the earth's dark main shadow and into the thinner outer shadow called the penumbra

The earth was completely out of the umbra at 9:09 p.m. and the penumbral portion of the eclipse ended at 10:15 p.m., with the full moon shining with its total brightness again.

The next full eclipse of the moon does not occur until 2010, Harris said.

Visitors also enjoyed a good view of Mars. The red planet was in clear skies almost directly overhead at mid-evening.

North-central B.C. residents may have been the first to see the satellite fragments after the impact from the missile, Sluka said. The North Pacific is unpopulated. The B.C. Central Coast is lightly populated, and may have been clouded over at the time the fragments passed over.

Sluka received calls and requests for interviews from radio stations in Edmonton, Toronto and even as far away as university radio station 2NURFM in Newcastle, Australia.

*Paul Strickland*

# Star-Hopping in Virgo

by Brian Battersby

Welcome to the realm of galaxies! Virgo contains hundreds of galaxies eleven of which made Messier's catalogue.

According to an ancient Babylonian legend Virgo was the goddess Istar. Istar's lover was Tammuz, the god of corn, he was killed at the prime of his life in the autumn. Each fall Virgo travels to the underworld to rescue him, while she is gone winter reigns and when she returns with Tammuz in the spring the season renews.

## Hop #1: Beta Virgo – Double Star

Beta Virgo is famous for being the star used by Einstein during the solar eclipse of September 21, 1922 to determine the speed of light in space. The star is called Zavijaveh which means "the gloriously beautiful". Beta Virgo is a mag 3.8 star while the companion is mag 8.8. It is located at the end of the "Y" part of Virgo of the side farthest away from the rest of the constellation roughly  $28^\circ$  to the northwest of Spica.

## Hop #2: M90 – Spiral Galaxy

M90 is one of the brighter spiral galaxies in Virgo at mag 9.5. Its spiral arms are tightly wound to the core. M90 appears to be "fossil" meaning that it currently lacks any new star formation, with the exception of the inner disk region near the dark dust lanes. To locate it start your star-hop at Epsilon Virgo then go west about  $4^\circ$  to Flamsteed 34 from there M90 is about  $2.5^\circ$  to the northwest. There is a 8.8 mag. star  $15'$  from it.

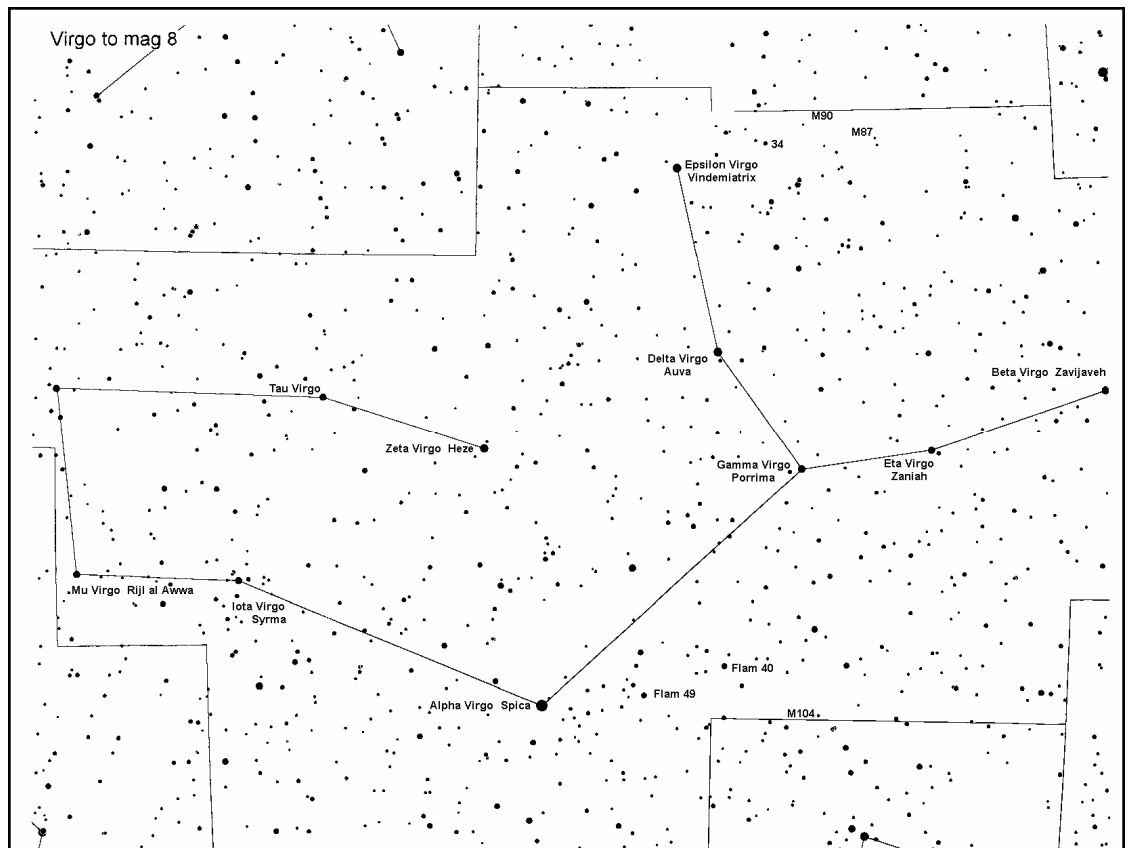
## Hop #3: M87 – Elliptical Galaxy

M87 is a very bright galaxy but, because it is elliptical it shows no spiral arms. It is about  $4'$  in diameter with a large core. To find it look about  $1.4^\circ$  to the southwest of M90. You might notice another smaller galaxy between M90 and M87 this the elliptical galaxy M89. M89 seems to have been discovered by Charles Messier himself.

## Hop #4: M104 – Spiral Galaxy

M104 is most known by its popular name the Sombrero galaxy. It is one of the showpieces of the sky due to the nearly edge on view we have of it. The dark dust lanes nicely split the large central bulge giving M104 its "sombrero" look. To find the Sombrero galaxy start at Spica then move  $4^\circ$  to the west to Flamsteed 49 (mag 5) from there move west again another  $4^\circ$  to Flamsteed 40 (mag 4.8) M104 is now  $4^\circ$  to the southwest. The nearest bright marker star is a mag 6 star high in Corvus (near the southern border of Virgo) about  $1.27^\circ$  to the south of M104.

Good viewing and good luck!,  
Brian



RASC: Calgary Centre  
**STAR-B-Q**  
*Eccles Ranch Observatory*  
*July 4th-6th 2008*

**Fun for the Whole Family!**

Have family or friends visiting you this summer?  
Then you should add the Star B-Q to the itinerary.  
A star party will be a new and different experience.

This annual event is brought to you by the Calgary Centre of the Royal Astronomical Society of Canada.

The Star-B-Q is held at the Eccles Ranch Observatory just north of Caroline in beautiful west central Alberta. Come join us for great fun and great viewing under some beautiful summer night skies.

Saturday evening will start off with an all-included Pig Roast followed by the draw for prizes, plus everyone gets the newly designed 2008 pin. To test your observing skills, take the Star-B-Q Binocular/Telescope challenge designed specially for the Star-B-Q.

Directions with map and more information are available at <http://calgary.rasc.ca/starbq2008.htm>.

Email: Starbq2008@shaw.ca

Send cheque (made out to RASC Calgary Centre) and registration form to:

David Brown  
1175 Hunterston Road NW  
Calgary, Alberta T2K 4M9

Camping for the weekend (\$20/vehicle) \$ \_\_\_\_\_  
Pig Roast (\$18/person) \$ \_\_\_\_\_ (deadline **June 25** then its \$23/person)

Total Enclosed \$ \_\_\_\_\_

Please Tell Us About Your party.

Surname: \_\_\_\_\_

Family Members: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Telephone: \_\_\_\_\_

Would you like to be on our e-mail list?

E-mail: \_\_\_\_\_

**Want to join the RASC Prince George Centre?**  
 Fill out the form below and mail it in to the address at the top of the form.  
 Existing members can use this form to renew as well!



**THE ROYAL ASTRONOMICAL SOCIETY OF CANADA**

LA SOCIÉTÉ ROYALE D'ASTRONOMIE DU CANADA  
 136 Dupont Street, Toronto, ON M5R 1V2 Canada  
 Tel: 416-924-7973 Fax: 416-924-2911 Email:

**mempub@rasc.ca**

Website: <http://www.rasc.ca/> E-store: <http://www.store.rasc.ca/>

FORM UPDATED: 2008 JAN 07

*MEMBERSHIP APPLICATION*

APPLICATION DATE: \_\_\_\_\_

NAME \_\_\_\_\_  
(Please Print in Full)

ADDRESS \_\_\_\_\_

CITY: \_\_\_\_\_ PROV: \_\_\_\_\_

POSTAL CODE \_\_\_\_\_

TELEPHONE: ( ) \_\_\_\_\_

EMAIL: \_\_\_\_\_

MEMBERSHIP BASE FEES \$ \_\_\_\_\_

CENTRE SURCHARGES \$ \_\_\_\_\_

SUB-TOTAL \$ \_\_\_\_\_

EJOURNAL \_\_\_\_\_ INCLUDED

PRINTED JOURNAL \$ \_\_\_\_\_

(\$66.80 IN CAN / \$23 US INTERNATIONAL)

TOTAL PAID \$ \_\_\_\_\_

My cheque/money order is enclosed

(PLEASE MAKE PAYABLE TO RASC)

NOTE: FOR NON-CANADIAN MEMBERS PRICES ARE IN US DOLLARS.

VISA  MASTERCARD

# \_\_\_\_\_

EXPIRY DATE \_\_\_\_\_

SIGNATURE \_\_\_\_\_

Please return this form with your payment to:  
 The Royal Astronomical Society of Canada  
 136 Dupont Street, Toronto, ON M5R 1V2 Canada

MEMBERSHIP INCLUDES: OBSERVER'S HANDBOOK  
 6 ISSUES OF RASC EJOURNAL / 6 ISSUES OF SKYNEWS

Personal information is collected for membership  
 and/or order fulfillment purposes only.  
 See <http://www.rasc.ca/> for the RASC Privacy Policy.

**MEMBERSHIP CATEGORY**

YOUTH MEMBERS MUST NOT HAVE REACHED THEIR 21<sup>ST</sup> BIRTHDAY  
 AT THE TIME OF PAYMENT.

**ANNUAL MEMBERSHIP BASE FEES:**

- YOUTH \_\_\_\_\_ \$36.75
- ORDINARY \_\_\_\_\_ \$59.00
- LIFE \_\_\_\_\_ \$2100.00

**Please choose one affiliation:**

Annual Centre Surcharges			
<input checked="" type="checkbox"/>	Centre	Ordinary	Youth
	Belleville	8.00	4.00
	Calgary	13.00	8.00
	Charlottetown		
	Edmonton		
	Halifax		
	Hamilton	13.00	
	Kingston	5.00	
	Kitchener-Waterloo	30.00	10.00
	London	4.00	
	Mississauga		
	Centre Francophone de Montréal	22.00	5.75
	Montréal	8.00	5.25
	New Brunswick		6.25
	Niagara	4.00	
	Ottawa	5.00	
	Ottawa		
	Prince George	4.00	
	Québec	13.00	4.50
	Regina	4.00	
	St. John's	4.00	
	Sarnia		
	Saskatoon	10.00	
	Thunder Bay		
	Toronto (see note below)		
	Vancouver	3.00	
	Victoria	2.00	2.00
	Windsor		
	Winnipeg		
	Unaffiliated		

Surcharges support Centre activities. Please contact the Centres for details.  
<http://www.rasc.ca/member/2008/contactlist.pdf>

\* APPLICATIONS FOR THE RASC TORONTO CENTRE ARE PROCESSED LOCALLY.  
 Please visit <http://toronto.rasc.ca/content/membership.shtml> for details.

Please keep this portion for your records.



The Royal Astronomical Society of Canada  
 La Société Royale d'Astronomie du Canada  
 136 Dupont Street, Toronto, ON M5R 1V2 Canada  
 Tel: 416-924-7973 Fax: 416-924-2911

Email us at: **mempub@rasc.ca**

Your Membership is appreciated  
 Thank you.

Website: <http://www.rasc.ca/> E-store: <http://www.store.rasc.ca/>

DATE: \_\_\_\_\_ Amount paid \$ \_\_\_\_\_  CHEQUE  VISA  MASTERCARD

**Royal Astronomical Society of Canada  
Prince George Centre**

*AKA the Prince George Astronomical Society*

Phone: 964-3600

Email: [pgcentre@yahoo.com](mailto:pgcentre@yahoo.com)

Website: [www.rasc.ca/princegeorge](http://www.rasc.ca/princegeorge)

Back issues of PeGASus available on  
our website.

**Royal Astronomical Society of Canada  
Calgary Centre**

*would like to cordially invite you  
to attend the:*

**Alberta Star Party**

September 25-28, 2008  
Starland Recreation Area Campground

**David Brown (403)-246 4498**

email: [ASP2008@shaw.ca](mailto:ASP2008@shaw.ca)  
[www.calgary.rasc.ca/asp2008.htm](http://www.calgary.rasc.ca/asp2008.htm)



*For All Your Home & Office Needs*

-  **Stationery**
-  **Printing**
-  **Furniture**
-  **Photocopy**
-  **Art**
-  **Promotional Product**

*A Proud Supporter Of Our Community!*

490 Brunswick St.  
Prince George, BC V2L 2B6



Phone: (250) 562-2414  
Toll Free: 1-800-667-9633  
Fax: (250) 562-9159

*This newsletter is printed courtesy of  
**Spee-Dee Printers**  
We thank you for your support.*