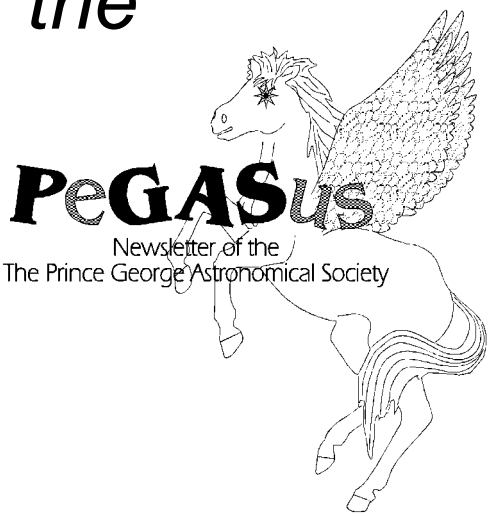
PeGASus
Newsletter of the
Royal Astronomical Society of Canada
Prince George Centre

# The RASC-PG meets next at 7:30 pm Wednesday November 24 at The Observatory

Map on Page 2

# November 2004

*the*

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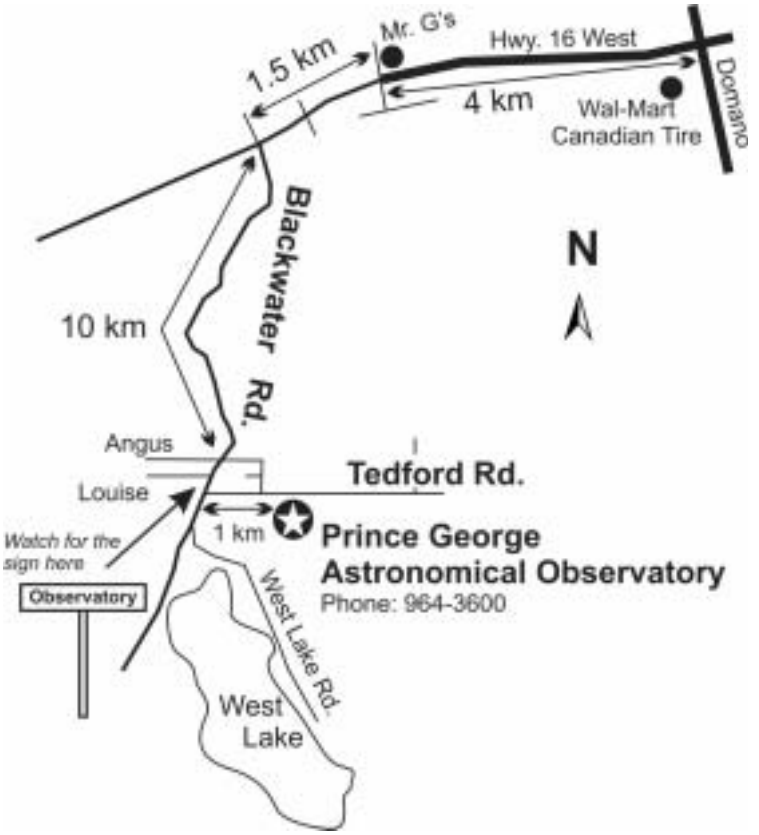
*the PeGASus*
is published monthly by the
**Royal Astronomical Society Canada**
**Prince George Centre**

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




Contributions to the newsletter are welcome.

***Deadline for the next issue is***

## *January 12*

***PeGASus Editor***

***Gil Self*** **gil-pg@shaw.ca**

Send correspondence to
**Prince George RASC**
**7365 Tedford Road**
**Prince George B.C.**

**RASCPG**
**Executive, 2004/2005**

**President**
**Brian Battersby**
564-4789
blbattersby@shaw.ca

**Vice President**
**Gil Self**
964-7279
Gil-pg@shaw.ca

**Secretary**
**Glen Harris**
562-4488
g_harris@telus.net

**Treasurer**
**Wayne Sanders**

**National Council Rep**
**John Ascah**

**Members at Large**
**Maurice Sluka**
**Greg Mohammed**
**Bob Nelson**
**Robin Riordan**
**Jim Toews**
**Doug Wayland**

**Past President**
**Bob Nelson**
563-6928

you can renew your membership at
www.rasc.ca/princegeorge

# Message from the President

Welcome to the 2004 / 2005 fiscal year everyone! I am really looking forward to this year. I believe it will be our best year ever.

Over the last few years we have made some terrific changes in the club. The facilities have been greatly improved, how the club operates has become more open, transparent and professional and our membership has steadily increased.

Right now we are working on making huge improvements in our public outreach programs. Robin and Wayne are putting together lesson plans to actually teach astronomy when students come to the observatory rather than simply showing them a presentation. The first time they offered this approach at the Pro-D day event in October the response was overwhelming with many more children wanting to attend then they could accommodate. The offering of some kind of astronomy education classes will be the next major growth area for the club. Truly allowing us to say that we are a one of a kind facility in Canada.

I was talking with a fellow I know through my work the other day about how when people in Prince George do something they take great pride in it and accomplish it to a high level. In our discussion I used the astronomy club as an example of that. I mean really, who else in the RASC has such a terrific facility? We have a 0.6 meter telescope, tons of "goodies", incredibly talented members with a HUGE work ethic and a passion for astronomy. I was absolutely amazed when we had 11 members sign up to be on the executive this year. That is 23.4% of the club! I challenge any other Centre to say they have greater membership participation than us!

In short this will be the best year our club has seen since it was formed, I challenge each and every one of you to be involved in it and I thank you for giving me the honor of being your President.

Brian

*I think what Brian is saying is well illustrated by a recent exchange on the National Council Lists :*

At today's national council a number of people expressed the opinion that small centres are never going to have the critical mass of active members to be able to undertake the sort of major project that could benefit from the proposed Centre Projects Fund. I'll just make the observation that In 1992 the Prince George Astronomical Society (the predecessor club to the Prince George Centre) had about 20 members when they set about building what is now the finest club- or center-owned observatory in Canada. It just took the drive of one man, Dr. Bob Nelson, and his ability to motivate people and fund raise. The five-year observatory project, in itself, doubled the membership. But almost all of those members became active members, not just a few. (This was that club's second major observatory. They built the 24-inch Cassegrain as well the first time.)
>>> > Dare to dream,
>>> >
>>> > Alan Whitman

Brian Replied ( in part )
>Alan;
Thank you for your kind words from the Prince George Centre! While I think Bob would acknowledge that there has been a host of other people behind him you are quite correct in saying that without him we wouldn't be where we are today!

# Coming Events

Open House – every Friday night (August to end of November)
Members Night – every Saturday night (August to end of November)
Rain or Shine
***Christmas pot luck December 8th***
**Leonid Meteor Shower:** November 16 at the Observatory 8:30 pm
**General Meeting:** Wednesday November 24 at the Observatory 7:30pm
Presentation by Greg Mohammed.
Gyroscope Precession and General Relativity

I must apologize, last month (issue 139) , I suspect I fell briefly into some kind of non-Euclidian space , some strange space time wormhole wherein I momentarily thought it was November. Duh! Here is Bob's offering as intended. Sorry!
Gil

# The Night Sky for December 2004

by Bob Nelson, PhD

Hi Folks,

As I mentioned last month, my wife and I will be in Australia when you read this. Hopefully, I will have been able to squeeze in a few visits to some astronomical observatories -- I'll give you a report when I return! I also promise not to flaunt my suntan!

Anyway, here is what will be happening in our skies this month:

PLANETARY ROUNDUP:

**MERCURY**, speedy Mercury, is an evening object until it reaches inferior conjunction (between us and the Sun) on Dec 10 and a morning object thereafter. At month's end, it rises almost 2 hours before sunrise and is therefore a favourable apparition for us northern observers when it will be a 6" disk of magnitude -0.3. For the early folks (not this writer!!).

**VENUS**, in Libra until Dec 18 when it passes into Scorpius, is a morning object all month, rising at mid-month about 2 hours before sunrise when it is a 11" disk, 90% illuminated and of magnitude -3.9. It is in conjunction with Mars on Dec 3.

**MARS,** in Libra until just after Christmas (when it passes into Scorpius), is a morning object; at mid-month, it rises about three hours before sunrise, as the Earth once again is catching up to it in its orbit. It's still a 4" disk of magnitude 1.6.

**JUPITER**, in Virgo until 2005, is a morning object, still (hurry up!!). At mid-month, it rises at 01:50, PST and is a 34" disk of magnitude -1.8..

**SATURN,** in Gemini until 2005, now is an evening object. It rises at 18:05 and transits at 02:21, so it should be good viewing later in the

evening away to the east. It's a 20" disk of magnitude -0.1 and should have plenty to offer telescopically, as usual.

**URANUS**, in Aquarius until 2009, is an evening object again. It transits around 17:00 and sets at 22:00, PST. As usual, it's a 3.6" disk at about magnitude 5.7. It's still an interesting object, together with its satellites.

**NEPTUNE**, in Capricornus until 2010, is an evening object again this month (things change slowly for the outer planets!) At midmonth, at sunset, it is in the southwest at sunset and sets at about 22:00 PST. As usual, it's a 2.3" disk at about magnitude 8.0.

**PLUTO**, in Serpens until Sept 2006, is largely lost in the glare of the Sun this month.

Winter Solstice occurs on December 21 at 04:42, PST.

**CONSTELLATIONS** to look for in December (at 9:00 PM, PST) are Fornax, Eastern Cetus, Western Eridanus, Aries, Triangulum and Western Perseus.

Fornax (For, "The Furnace"), is another southern constellation , with the northern part visible to us in PG this month. Burnham's Celestial Handbook tells me that Alpha Fornacis (that's the Latin ending for Fornax) is a long-period visual binary first observed by John Herschel in 1835 when the separation was 5.3". During the next century, the separation narrowed to 0.9" but then started to increase. In 1963, the separation had grown to 1.9". I have this planetarium program, PC Sky, that animates visual binaries; it gives the separation and position angle as you time-step watching the simulated orbit. It tells me that in Dec 2000, the separation is 5.1". The latter will increase to a maximum of 6.1" in 2038 and will decrease to a minimum of 0.2" by 2264. The period is around 314 years -- how's that for a long-term phenomenon? Only in astronomy. We must look for the pair; in December, they will be 18 degrees above the southern horizon; Star A is 4.00 mags and Star B is 6.60 mags.

Eastern Cetus (Cet, "The Sea Monster"). Western Ceti was discussed last month, but in eastern Cetus, we see Omicron Ceti, or Mira ("The Wonderful" -- it is!). Mira was the first of the long period variables discovered since 1596 and monitored by the America Association of Variable Star Observers. Much was said a year or so ago, so I won't repeat myself. 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. It also contains the multiple stars system Omicron 2 Eridani. Stars B and C (9.9 and 11.2 mags respectively) undergo a 252-year orbit. At present, their separation is 9.2" (easy) and is near maximum.

Aries (Ari, "The Ram"), is the first entry in the Zodiac and is a northern

*From page 5*

constellation out of the Milky Way. The brightest star, Alpha Ari (a.k.a. Hamal) is a red giant (sp. K2 III) and lies about 75 light years distant. It also has a couple of nice NGC objects - NGC 972 (a coarse spiral) and NGC 1156 (an irregular system). Both are relatively faint (both of magnitude 12.2) but should show up well on CCD images of moderate exposure.

Triangulum (Tri, "The Triangle"), is a small constellation just south of Andromeda and contains the famous galaxy M33 ("The Pinwheel"), which is a member of the Local Group of galaxies It was discovered by Messier, in August of 1764. If you've ever observed M33, you'll marvel at how Messier saw it since it's a diffuse, low-surface brightness object which can be a challenge in a small telescope. Try using moderate power in a telescope with clean, well collimated optics on a very dark night with good clarity. (CCD images taken then should turn out well.) Like M31, it has been the subject of intense study by professionals with large telescopes; many variable, novae, planetary nebulae, etc have been discovered.

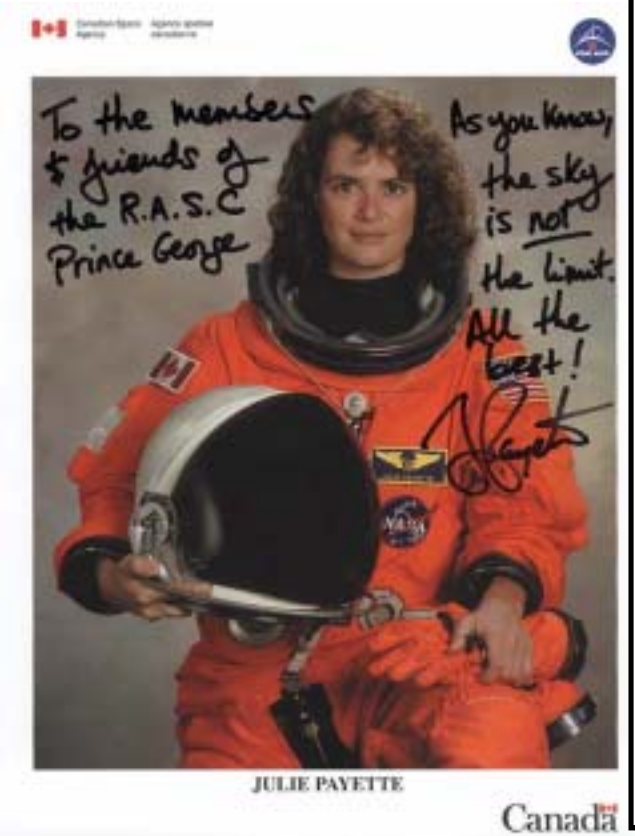
Cheers,
Bob Nelson

## Pro D Day at the RASC Prince George Centre

The RASC Prince George Centre played host to about 25 students and their parents on Professional Development Day (October 22, 2004). Professional Development Day provides the teachers of Prince George with the time and opportunity to meet for conferences and workshops. While the teachers meet their students are provided with an opportunity to attend educational and recreational activities in the community.

Wayne Sanders and Robin Riordan assumed the educational responsibility this year. The program they developed included: construction of a pinhole camera, building a simple refracting telescope, modeling lunar impact craters, and, of course, a tour of the 24" telescope. The students also view a wonderful video called Solar Max.

You may have noticed from the minutes of the Annual General Meeting notes that Robin was appointed to the Community Outreach/ Education committee. In an effort to make this committee a real and viable part of the Prince George RASC, Robin will be contacting the teachers of the students who attended the Pro-D Day activity. The resources of our society will go untapped without public awareness. Hopefully, as awareness in the community increases, demand for our expertise will increase. This being the case the need for a larger body of volunteer teachers and presenters will increase. If you are interested in contributing your talents to the Society's educational efforts, contact Robin by e-mail at: robinriordan@shaw.ca, or by phone at: 649-0992.

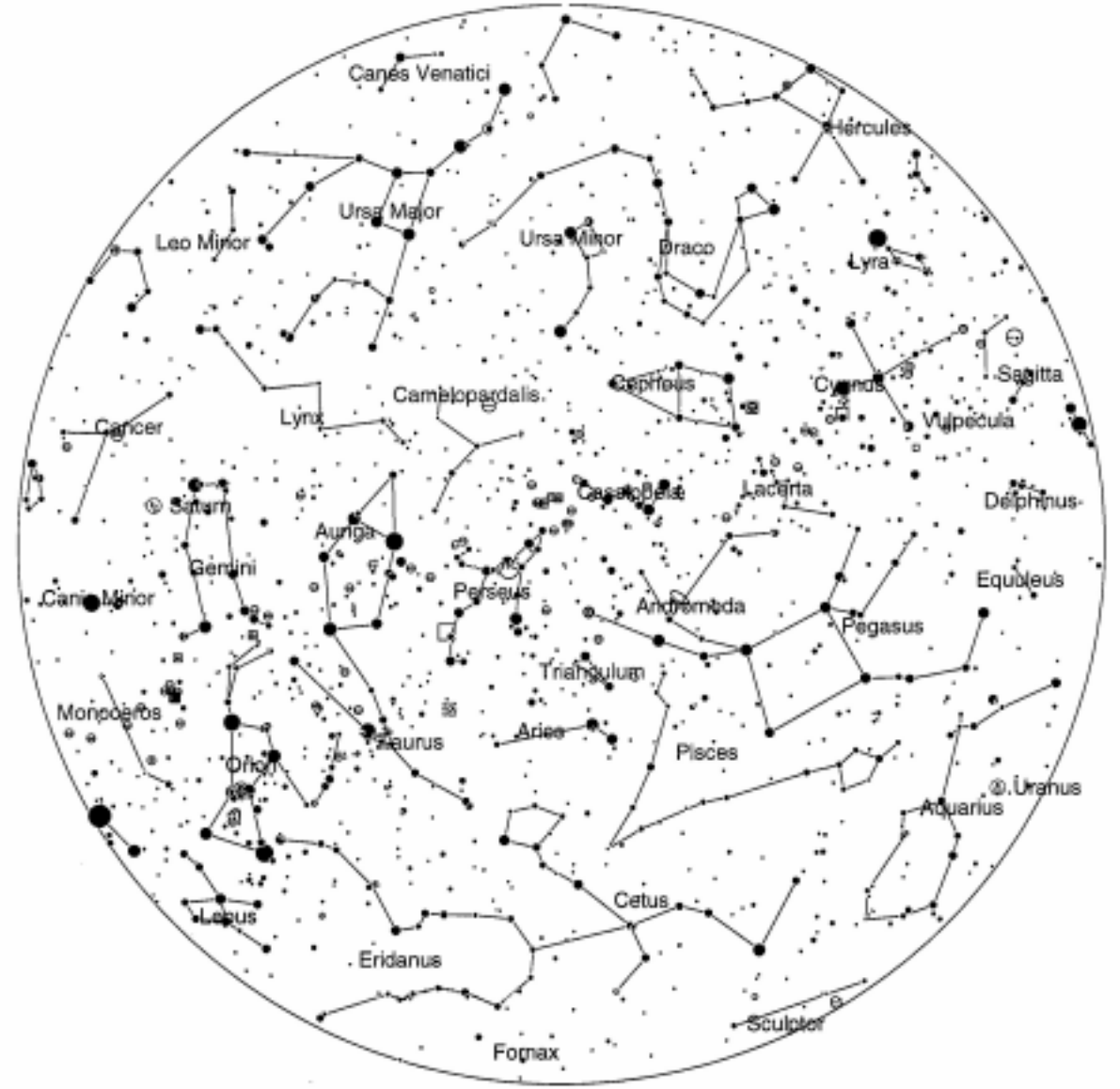



# Julie Payette Visits Prince George

On October 15, 2004 Julie Payette gave a presentation at UNBC, in the Weldwood Lecture Theatre. Her very inspiring talk showed the us the wonders of space travel. She spoke of her mission aboard the space shuttle Discovery, STS-96. The mission she flew on was also the first to dock with the space station. Ms. Payette was the first Canadian to work on board the International Space Station. One of the other mission objectives for STS-96 was to launch the STARSHINE (Student Tracked Atmospheric Research) satellite. It was easy to tell how much she enjoyed being an astronaut and how incredibly talented she is. I was also impressed that for her trip to Prince George she had combed through the images taken from the space shuttle to find an image that actually showed Prince George! This was especially nice due to the fact that she was really here to attend a meeting and giving the presentation was just something she offered to do because she was in town anyway. After the talk she very graciously signed a photo for the RASC Prince George members. I am proud to know she is Canadian. ~ by Brian Battersby

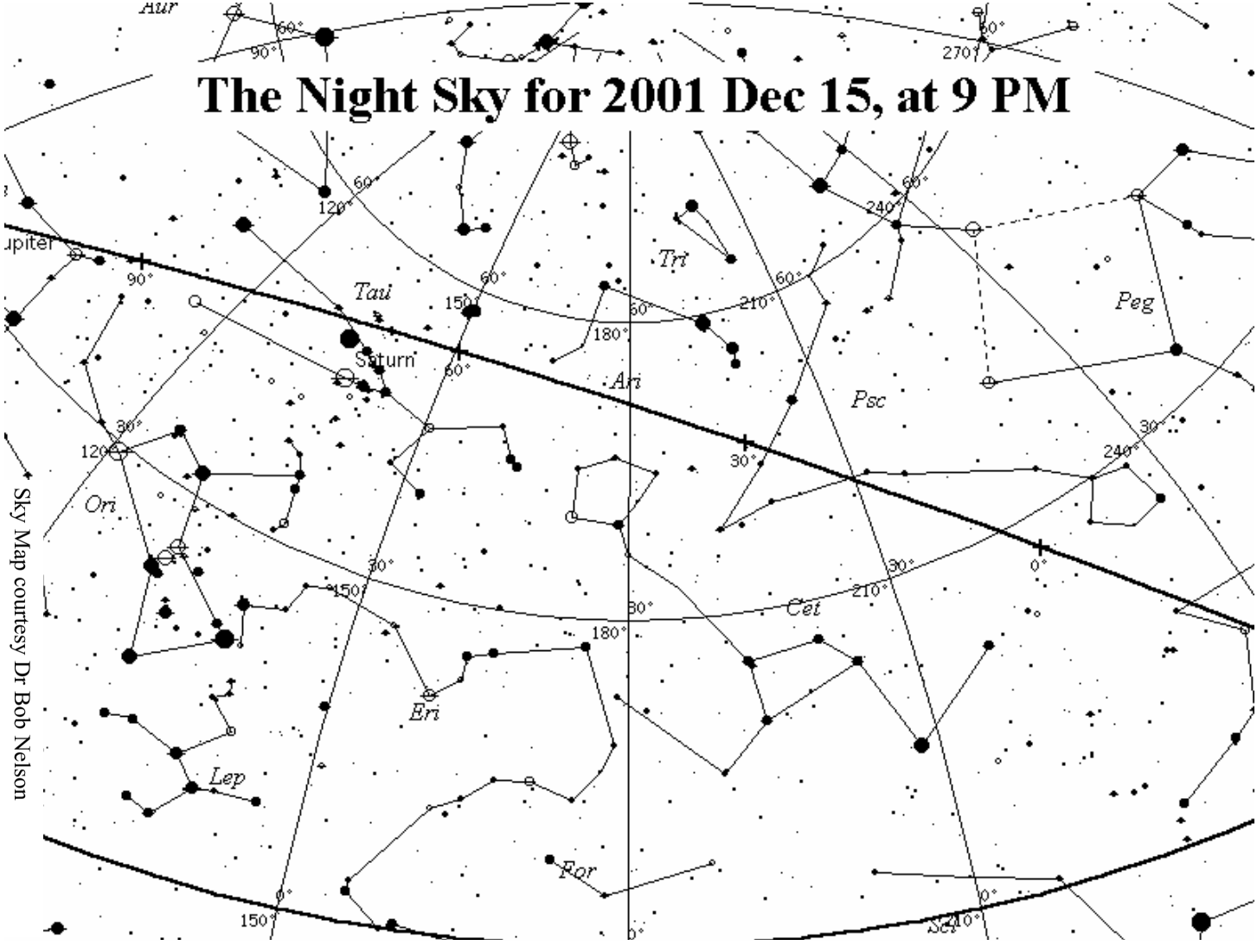
Prince George from Space Shuttle Columbia (STS-28) 1989

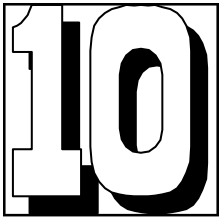
Gift Ms. Payette presented the RASC Victoria Centre March 11, 2000 Shows the flight of STS-96 from beginning to end.




# SOUTH

All sky map for December 15th, 2004
9:00 pm
Prince George Astronomical Observatory


The Night Sky for 2001 Dec 15, at 9 PM
Aur
Jupiter
Tau
Saturn
Ori
Lep
Eri
For
Cet
Ari
Psc
Tri
Peg
Sky Map courtesy Dr Bob Nelson



[1.1] $$ds^2 = -c^2 dt^2 + dx^2 + dy^2 + dz^2$$

[1.2] $$ds^2 = -dt^2 + dr^2 + (b^2 + r^2)(d\theta^2 + \sin^2\theta d\phi^2)$$

[1.3] $$dS^2 = dr^2 + (b^2 + r^2)(d\theta^2 + \sin^2\theta d\phi^2)$$

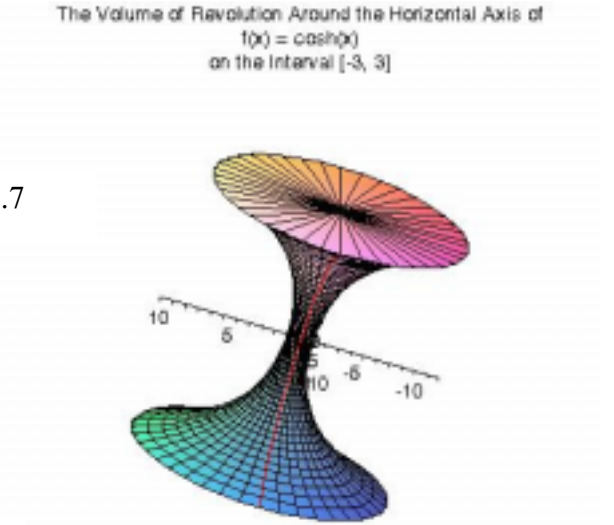
[1.4] $$d\Sigma^2 = dr^2 + (b^2 + r^2)d\phi^2$$

[1.5] $$dS^2 = d\rho^2 + \rho^2 d\psi^2 + dz^2$$

[1.6] $$\rho(z) = b\cosh\left(\frac{z}{b}\right)$$

Our Williams Lake member (and web host )Evan Williams, took his daughter and grandsons To Mt Kobau this summer. Guess who won the grand prize 11 year old, Brandon Burns , he looks pretty pleased. Congratulations

1.7



# Deriving a Wormhole.

Gregory Mohammed



1st November, 2004

The term 'wormhole' has been around now for some years. It is commonly heard in television shows such as Star Trek and in various sci-fi movies. People use the term in their everyday speech and joke about traveling through a wormhole to other dimensions or to other parts of our Universe. But, how many of us really know about wormholes? What are they really? How did they come into the human consciousness? They must have come from somewhere!

Well, yes they did come from somewhere... Were they observed? No. A wormhole has never been observed, and probably never will be, since they require negative energy to 'live'. So much for the popular trekkie wormhole endeavours! And yes, I know
you cannot wait for me to get to the point,... so I will.

Wormholes are mathematical constructs, with some help from physics. They are derived from something called a metric. A metric is a line element describing the structure of spacetime. The line element for flat space is as follows:

***function [1.1]***

The 't' component represents the dimension of time, thus making equation 1.1 a four dimensional relation for our spacetime. 'c' is usually taken a equal to 1 as this makes involved calculations easier. And the minus sign? I will not get into that here; let me just state that it is key to making equation 1.1 invariant. So now you know what a metric is (it is that simple!). Note: When we are dealing with spacetime distances, we use small 's'. For spatial (no 't') distances, we use big 'S'. Now let me throw another metric at you, and this one is the one that will be used to derive the wormhole geometry.

***function [1.2]***

I could show you what the Schwarzschild metric looks like, but I think I will spare you that (unless I get requests for it in another article). Now, we are going to use a method called embedding to derive the wormhole geometry from the metric 1.2.

Embedding involves using a two dimensional slice of a four dimensional geometry in three dimensional flat space in order to learn some useful things about that geometry. We cannot draw a four dimensional geometry as that would require at least five dimensions, and we are limited to three. Now, a t = constant slice of the geometry 1.2 is a three dimensional spatial geometry with metric,

***function [1.3]***

Now, the metric 1.3 is spherically symmetric, which basically means that it contains the geometry of a sphere. Thus, a picture of it can be built up by looking at two dimensional slices $\theta = \frac{\pi}{2}$ at a constant angle, say .
The geometry is now,

***function [1.4]***

This metric has rotational symmetry since it had spherical symmetry. Thus, we can embed this slice as an axisymmetric surface in three dimensional flat space. We use cylindrical coordinates to do this, so that the metric is transformed to,

***function [1.5]***

Now, I am going to skip to the final part of this exercise. The parts that I am skipping are not trivial! For the sake of space, I have to leave them out. Also, they require, I think, detailed explanation which, again, would take up a lot of space.

We get the ***function,***

***[1.6]***

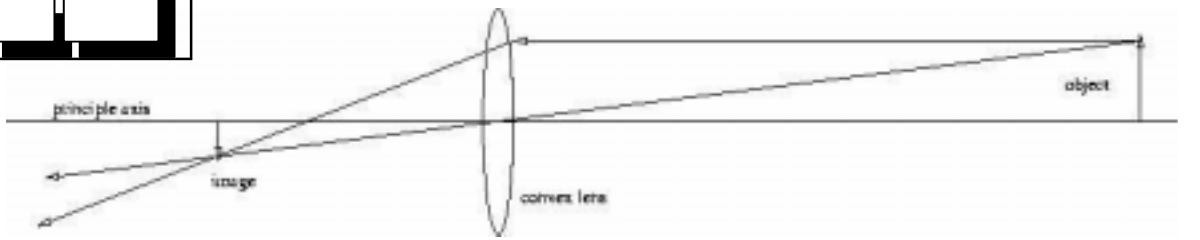
When the function 1.6 is plotted and rotated around the z-axis, we get the wormhole geometry, as shown . ***1.7***

So there you have it! This is where the idea of a wormhole came from. True, the Schwarzschild metric is what is really used to generate the wormhole geometry, but this exercise is a nice way of expressing the idea of a wormhole.
Clear skies!

G.M.

# Constructing Optics Diagrams

**Robin Riordan**




During our presentations to the Vanderhoof students and the experience of Pro D Day Wayne and I have noticed that one of the most common questions students have is, “Why does everything look upside down?” So, I thought a little optics review might be in order so that we can all give the questioner a simple graphical answer.

Let's start with a concave reflecting surface.
There are only two lines you need to draw to locate the image formed by a mirror.

1)Draw a line from the object through the focus and bounce it off the mirror parallel to the principal axis.
2)Draw a line parallel to the principal axis to the mirror and bounce it off through the focus.

The point at which the two reflected lines meet is where the image appears. In the diagram above I have drawn the lines just for the top (arrow) of the object. You can construct the rest of the image by picking more points on the object.

The image formed is called a **real image**. This simply means that the image is formed by lines that are converging to a point.

Now, let's take a look at a refracting telescope. Like a mirror, the lens system has only tow line drawing rules.

1)Draw a line from the object parallel to the principal to the lens then refract the line to cross the principal axis.
2)Draw a line straight through the centre of the lens to the refracted line.

The image is formed where the two lines meet.

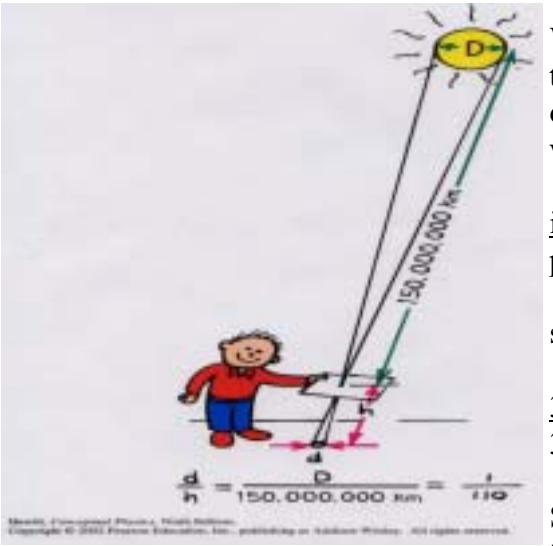
The diagrams begin to look complicated when the object is located inside the focus or when you are dealing with a convex mirror or a concave lens because virtual images are formed, **but** the same construction rules apply.

R.R.

13

# Measuring the Size of the Sun

The total lunar eclipse of October 28 brings us to the second part of the adventure of determining the diameter of the Sun. Last month we used a pinhole projector to determine the ratio of the the Sun's diameter to its distance. Following is a diagram of the setup.




With my ideal pinhole camera we measured the diameter of the Sun's image as 3mm. The distance between the pinhole and the screen was 330mm.Remember the ratio:

$$\frac{\text{image distance}}{\text{projection diameter}} = \frac{\text{Sun's distance}}{\text{Sun's diameter}}$$

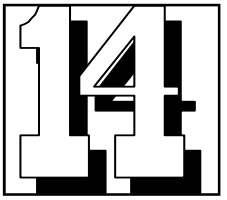
so

$$\frac{330\text{mm}}{3\text{mm}} = 110$$

So our equation becomes:
Sun's distance = 110 * Sun's diameter
All we need is to either out the Sun's diameter or its distance to get the other value. This is where the eclipse comes in. But first let's back up to another brilliant piece of science by Erastosthenes. We need this experiment to make use of the eclipse.

Around 235 BC Erastosthenes measured the size of the Earth. He had learned from the archives in the Great Library of Alexanderia that the Sun appeared directly overhead on the summer solstice in an Egyptian town called Syene. In fact, one could see the image of the Sun at noon reflected directly back upward from a deep well there. You and I know that this means that Syene must be located at 23.5 degrees north latitude. Erastosthenes measured the angle of the Sun's shadow casted on the same day in his town of Alexandria as 7.2 degrees. He also knew that the distance between Syene and Alexandria was 800 km north (along the same arc of longitude). Great! He now had a triangle. Let's look.

R.R.



ROYAL ASTRONOMICAL SOCIETY OF CANADA
PRINCE GEORGE CENTRE
7365 Tedford Road
Prince George, BC
V2N 6S2

**Annual General Meeting Minutes**

Date: October 20, 2004
Location: PGAO 7365 Tedford Road

Chairperson: Brian Battersby

Recording Secretary: Glen Harris

Executives Present: Glen, Rod, Gil, Brian

Members Present: Maurice, Wayne, Robin, Jim, Art, Greg, Bob K, Doug, Glenn

Guests Present: Lauren

Meeting called to order at 7:28 p.m.

1. Previous Meeting Minutes
September 29, 2004 General meeting minutes
October 6, 2004 Executive meeting minutes
Motion to Accept September 29, 2004 General meeting minutes as circulated.
Moved: Glen Seconded: Gil Carried

2. Treasurer's Report:
As of October 18, 2004

| Club Account | | Gaming Account | |
|---|---|---|---|
| Total Income | $4258.66 | Total Income | $1261.12 |
| Total Expenses | $6052.56 | Total Expenses | $5726.60 |
| Total Income/Expenses | ($1793.90) | Total Income/Expenses | ($4465.60) |
| Total Net Worth | $996.49 | Total Net Worth | $96.51 |

Motion to accept the Treasurer's report as presented.
Moved: Gil Seconded: Glen Carried

3. Correspondence
Various RASC Centres newsletters.

4. Old Business
None


5. New Business
Free Press reporter Teresa will be conducting an interview at the observatory on Thursday October 21st. Her interview will cover the NVSS school tour in progress, the Pro D day plans for the following day, and the upcoming lunar eclipse on the 27th.

5. New Business (continued)
Wayne and Robin have been preparing for the upcoming Pro D day activities to be held on Friday, October 22nd. Response has been high. Planned activities include:

| | |
|---|---|
| SolarMax video | Pin Hole Camera |
| Telescope type discussion | Construct a simple telescope |
| Demonstration of mirror grinding techniques | |
| Lunar impact lab | Solar surface granulation study |
| Short tour of the facility | |

Robin and Karen traveled to Tatla Lake to observe first hand the robotic telescope being set up at the local school. Robin's involvement in this project will be to instruct the local teachers in how to process CCD images.

Results of the Annual Election are as follows:

| | |
|---|---|
| President: | Brian Battersby |
| Vice President: | Gil Self |
| Secretary: | Glen Harris |
| Treasurer: | Wayne Sanders |

National Council Rep: John Ascah

| Members at Large: | Committee Directors: |
|---|---|
| Greg Mohammed | Light Pollution Abatement - Maurice |
| Bob Nelson | Public Outreach/Education - Robin |
| Robin Riordan | Building Maintenance - Glen |
| Maurice Sluka | Telescope Maintenance - Wayne, Bob, Glen |
| Jim Toews | Observing/Tour Director - Brian |
| Doug Wayland | Fund Raising - Gil, Bob |

Volunteers for November Events

| Open Houses | Member's Nights |
|---|---|
| November 5 Gil | November 6 Wayne, Robin |
| November 12 Wayne | November 13 Doug |
| November 19 Maurice | November 20 Maurice |
| November 26 Brian | November 27 Brian |

6. Upcoming Events
November 1 Shady Valley Brownie tour at 7:30 pm
December 8 Christmas Pot Luck dinner at the Observatory. Time to be announced.

Meeting adjourned at 8:48 p.m.

7. Presentation
Art gave a lecture entitled 'Energy and Tides'