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

# May 2006

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

In Issue # 152



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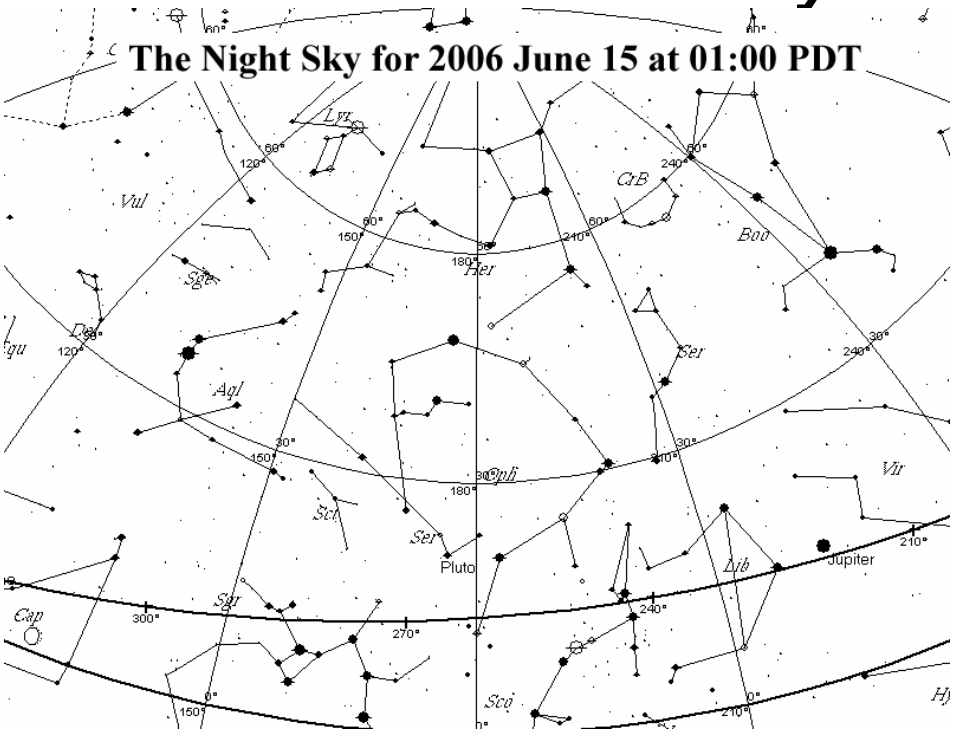
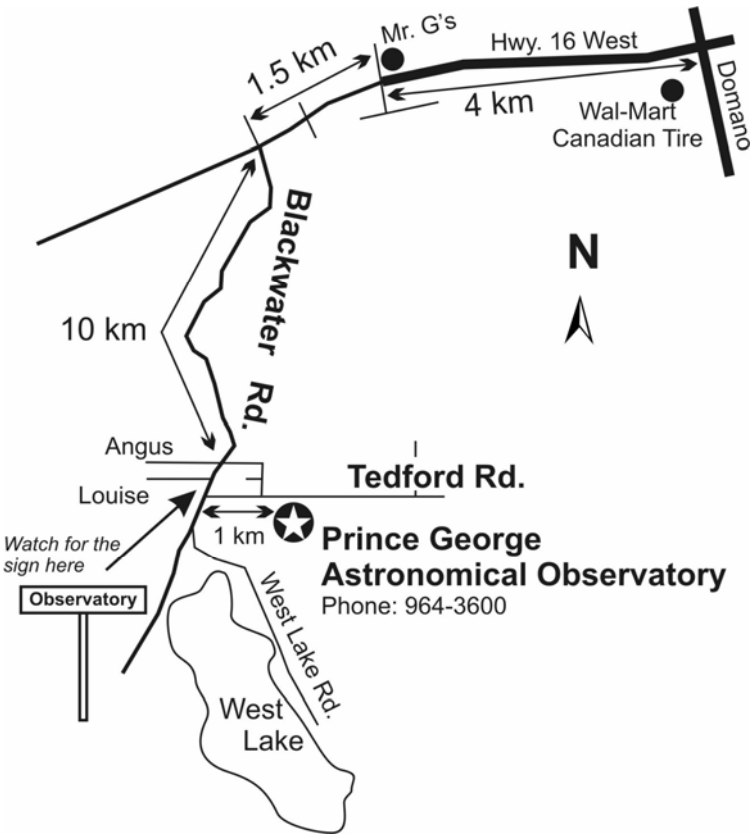
## The RASC-PG meets next, 8:00pm Wednesday May 31 at The Observatory






Contributions to the newsletter are welcome.

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

## *August 18*

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# Coming Events

Executive meeting 6:30 pm May 31
General Meeting 8:00 pm May 31
At The Observatory

Summer Bar BQ
Saturday June 10 at 5:00 pm

Summer Maintenance work-bees TBA

Perseids Open house
Saturday August 12

# Editorial

Gil Self

Over the years I've tried to use this page to keep club members informed.. Sometimes you just can't make it to a meeting or a club event. We all hope that you can make it out to a few events each season and hopefully volunteer for a few more. That is becoming a problem, we have never tried to place any obligations on being a member and I don't think we are going to any time soon. But we are having that same problem we have had many times in the past. Too few people and too many events. If you can spare an evening a month, we could ease the strain on the volunteers currently working far to frequently each month. I think most folks feel they are not up to the task, trust me, you know a lot more about astronomy than the average person who walks in the door. ( " no ma'm that's astrology not astronomy" )You can start, if you wish by simply assisting another member. We can help by training you on all the equipment we have, and back you up with the things you can't answer. Try it out , It's actually a lot of fun.

Another matter that I think everyone needs to know about :

We are currently discussing much needed modifications to the observatory. The dome will be motorized and coupled to the telescope to keep the slot in front of the scope. The drives will be upgraded to high accuracy stepper motors. These two items will allow for what is generally called a go-to scope. This should allow you to simply select a target on a computer screen and without any fuss the scope will slew to the target and track it. This should mean that even the newest members can use the 24 inch scope. Right now there is a certain amount of hocus pocus involved and this new system should allow many more objects to be found easily on a tour or open house.

The other item that is somewhat controversial and I think if everyone understands the reasoning we will all agree on the need. We need to up-grade the telescopes imaging camera. This is not a small investment, so therefore questions have come up regarding the need for such an expensive purchase. Could we not us a television camera or web cam or perhaps a high end SLR? Yes we could but none of those allows for any kind of scientific value in the images captured. The unit we are looking at is on the low price range of the science grade equipment. With this kind of camera we can of course take beautiful colour pictures. But we can also measure magnitudes, angular separation, colour temperature and guide the telescope. These CCD imaging cameras have changed astronomy. They allow small observatory's, like ours, to do the type of work that required a multi million dollar observatory just a decade or two ago. This is not an extravagant purchase, this is going to change what we can do with the observatory.

If we can successfully complete the wide angle Newtonian modification that has been underway for a couple of years, this telescope will certainly be one of the most capable instruments in the country, **and it's all ours**!

G.S.

# The Night Sky for June 2006

by Bob Nelson, PhD

Hi Folks,

As I write this, I am moving into a different lifestyle. My backyard robotic telescope has encountered a software problem and has been shipped – all 94 pounds of it – back to the manufacturer for servicing (there are other problems as well). I have not decided at this point whether or not to upgrade to their newest model. In any case, I am out of business for my own observing of eclipsing binaries and will now take on other challenges. Happily, the downtime could not have occurred at a better time, since I usually try to give up observing around now anyway, in order to become a daytime person and follow outdoor pursuits! However, I will miss observing.

These 'other challenges' will include the upgrading of our 24" telescope. After numerous attempts, I have located a supplier for the large worm gear that will be needed for the declination axis. It is none other than Ed Byers himself! The old gent is over 80 now, and is still working. His gears have long been prized by astronomers everywhere; happily he can quote a reasonable price (around $2000 US), sounds enthusiastic, and promises a delivery time of 30-60 days – a lot better than one might have expected. Your executive will be looking at ways and means to see if we can move ahead on this without too much delay.

The goal, of course, is to transform our venerable 24" into a modern "go to" telescope. Eventually (we hope), it will be fully computer-controlled, will use powerful dc servo motors that will be capable of reasonable slewing speeds (20-30 seconds across the sky) and yet offer fine guiding speeds, and will lack any clutches. At least that is the goal towards which we will be working. The process will be to install the new hardware, and proceed in small steps to this goal, making sure that we can always go back. The telescope, as a result, should not suffer any serious downtime. Stay tuned!

Here is what is going on in the sky this month:

MERCURY is an evening object all month. According to the Observer's Handbook, it reaches greatest eastern elongation (angular distance from the Sun) of some 25° on June 20. At sunset on the 15th, it is to be found some 13° above the WNW horizon. It's a 7" disk of magnitude 0.3. By the end of the month, it will be again lost in the glare of the Sun

VENUS, a morning object, is a morning object in June, rising as it does at mid-month at 03:00, only 1 ½ hours before the Sun. Its brightness will fade over the weeks as it recedes from the Earth and becomes smaller in angular size.

MARS, in Cancer until July 2, when it passes into Leo, (and thence into Virgo on Aug 29). On June 15, it passes right through the Beehive Cluster. What about some photos??? At mid-month, it lies 21° above the western horizon at sunset; it sets at 00:23. Earth is leaving it behind once again – going, going …

JUPITER, in Libra until December, is very visible this month. At mid-month, it lies 22° above the southern horizon at sunset; it sets some 5 hours later. As usual, it's a whopping 42" disk of magnitude -2.4.

SATURN, in Cancer until August 30 (when it passes into Leo), is an evening object in June. At mid-month lies at sunset about 21° above the western horizon and sets 2 ½ hours later. It's a 17" disk of magnitude 0.4. (still rather nice). Saturn is in conjunction with Mars on June 17 at about 19:00, our

time. Later that evening, the angular separation will not have changed much; the separation will be about 33' apart at that time. Photos, anyone? A caution, though – they will be close to the Sun and a good western horizon will be required. (The evening twilight in June goes on and on …!)

URANUS, in Aquarius until 2009 (March), is a morning object this month, rising as it does at mid-month at 01:00. As usual, it's a 3.6" disk at about magnitude 5.7.

NEPTUNE, in Capricornus until 2010 (March), is a morning object all month. At mid-month, it rises just after midnight somewhere in the northwest and lies high in the sky at sunrise four hours later. As usual, it's a 2.3" disk at about magnitude 8.0.

PLUTO, in Serpens until September, is visible this month all night (what there is of it). At sunset at mid-month, it appears some 7° above the southeast horizon (and therefore never gets very high in the sky). As usual, it's a 0.1" disk at magnitude 13.8 (not much to see).

Summer Solstice (for northern observers) occurs at June 21 at 05:26, PDT. Summer will have begun!!!

CONSTELLATIONS to look for in June (at midnight, PDT) are Corona Borealis, Hercules, Serpens Caput, Scorpius, and Ophiuchus.

In Corona Borealis, there are no Messier objects; but there are two interesting stars: Corona Borealis (CrB), a 17 day eclipsing binary of the Algol type and R Coronae Borealis (R CrB) which is the prototype of a small but distinctive class of variable stars. R CrB is normally at maximum light of about magnitude 5.8 but will fade suddenly and without warning by up to eight magnitudes; the minimum may last from several weeks to up to several years. It's thought that plumes of carbon (soot!) which shoot out from the star (in the later phases of its life) are the cause of the drop in magnitude.

The northern part of Hercules contains the globular clusters M13, M92 and NGC 6229 and is fairly familiar to most of us, since it's visible for a good part of the year.

Serpens Caput contains the fabulous M5, one of the best globular clusters visible in the northern hemisphere. It's right up there with M3 and M13.

Scorpius contains numerous globular clusters: M80, about 4 degrees northwest of Antares (Alpha Scorpii), M4, just one degree west of Antares, M62, about 7 degrees southeast of Antares, and M6, near the tail of the beast (which will be very low in our northern skies) plus other NGC globulars.

Ophiuchus continues on with the following globulars: M9, M10, M12, M19, M107, plus numerous fainter NGC globulars. Check 'em out!

This will be the last "Night Sky" for the season, so you're on your own until the August issue! (The constellations are all covered, since August viewing, although two months later, will normally occur earlier in the evening; you are therefore looking very conveniently at the next segment of sky. It all works out!)

Clear skies,
-Bob

# What's Out There

**By Fae Collins Mooney**

I came across a book once upon a time with the captivating title of *Wide Awake At 3:00 a.m. : By Choice or by Chance?* Well, with a title like that, what's a star-crazed dreamer to think? I bought the book, expecting to read about great astronomical viewing on moonless nights, or a super Perseid experience some mid August, or maybe even a good recipe for great hot chocolate. I didn't of course. The book was about insomnia, something we RASCals never have to worry about— right? If we're wide awake at three a.m. then it's definitely going to be by choice, isn't it? Something, out there, will draw us from our warm bed and we will be treated to some miraculous sight that might elicit a wide awake oooh or wow!

Books being a weakness of mine it isn't long before I found another book with a title I could not resist my curiosity about the cosmos and life cycles of stars was piqued when I caught a glimpse of *The Future of the Sun.* I bought the book and, although it does provide a nice overview of our solar system's history, overall it was more about the art of science (which I also appreciate) and the curiosity that we have for what's out there, and the importance of educating us wee humans about things astronomical.

The author, Jean-Claude Pecker, asks this question: "Why do people engage in astronomical observations?" And answers it " out of curiosity," he replies, "out of simple curiosity!" That's what gets us out of bed at three a.m. right? Well, there's more– he goes on to provide another answer; "I cannot end these pages without mentioning the almost physical emotion which certain astronomical phenomena can instill in you." It's true, isn't it? That joy we feel when watching some awesome celestial happening (which includes just about everything). There is a sense of excitement at witnessing a cosmic event, a feeling of awe– and humility. And then there's the learning– what we gain from our sojourns with the cosmos and where our curiosity will take us. "For the pleasure of understanding phenomena" M. Pecker states, "equals that of actually seeing them… the exceptional beauty" of those images, "the eternal attractions" of the night sky and the excitement seeing those three a.m. sights.

A few weeks ago another book title captured my interest, *Stars and Angels,* and I must admit that for me, there is something spiritual about looking up into that vast expanse, so, I bought the book. There are more angels between its pages than stars; however, on page 131 the author, Michael Stancliffe, shares this experience: "Yesterday, in another world, I looked into another universe. It was no dream, no hallucination following an overdose of science fiction… I slept last night under the open sky some five thousand feet up… All round were peaks and pine forests; no city's glare on the horizon; the nearest village six miles away and a thousand feet below; no human dwelling within three miles The silence of that remote spot was immense. But more awe-inspiring than the solitude and silence was the sky overhead: a cloudless, moonless expanse of velvet darkness studded and dusted with the silver of myriads of stars— a spectacle now rare… where the upthrown glare of city lights robs the darkness of its intensity and the stars of their brilliance. With such a ceiling above my head I was indeed in another world."

And that's what it's all about, isn't it?" about being wide awake at three a.m.; about being aware of wonder; about curiosity and speculation; mystery and awe; humility and appreciation; about cosmic thoughts and spiritual awareness and putting things in perspective. It's about understanding, and desiring to know more.

"It is a healthy experience." Rev. Stancliffe concludes, "to spend a night, if only in imagination, in such a remote silence and out of the man-made glare which conceals so much...and the magnitude of our own insignificance."

Wow! F.M.

# Wayne's Project

We as members of PGAS have been asked several times in the last months to provide some short article on what we are doing at home. I have been attempting to develop a low cost spectrograph centered around a SLR Lens, Light Slit, Eye Piece and a CCD Camera.

On the way to doing this I had to develop a camera system as well as beef up the scope tracking.

Think the following image has encouraged me to at least continue with the next step.

Note the round star images with little or no elongation, Tracking good.
Target was

M42 / M43 and area.

I had no idea what the FOV would be for this system. Calculation on image has determined that 1.7 degrees is a good number to use for the next step. This is a great FOV for other nebula as well so I will build remainder of the system to retain this set up.

The Orion Nebula image is 3 images of 120 sec each processed as CMY color and one 120 sec b/w which was sharpen then combined with Maxim DL for resultant image. making a total exposer time of 480 sec. or 8 mins.

Pictures of hardware used


Wayne Sanders

This is the first draft of the history of the PGAS

# The Observatory of the Prince George Astronomical Society*

*a.k.a. the Royal Astronomical Society of Canada – PG Centre

The idea of building an observatory arose at an impromptu gathering after one of instructor Bob Nelson's evening astronomy classes at the College of New Caledonia (CNC) back in the spring of 1979. The students, although not many, were comprised of adults from the community plus a few young people in the regular university-transfer stream. The students made up for in enthusiasm what they lacked in numbers.

The idea was to design the mount ourselves, have it built at the College, construct the building and dome, and buy the optics from a commercial supplier.

The meeting was largely motivated by a recent newspaper article in 'The Citizen' that the B.C. Lotteries Corporation was considering grant applications and that there had been no applicants from the north. Well -- we should do something about that!

Accordingly, Bob Nelson wrote a discussion paper and circulated it round. A 20" mirror was to be bought from Cross Optics (then of California). Eric Hoogstraten was to design the mount. Bob made a sketch of the observatory structure – a long building with a dome at one end with a classroom/meeting room occupying the rest. Objectives of the observatory were also written.

Somewhat hastily, a society was put together. A grant application asking for some $12,600 – including support from our local MLA at the time -- was written and sent off. Some weeks later ,we got the great news – we got all that we asked for! (The cheque was sent by mistake to the College of New Caledonia – there was not and never has been any formal link between the College and the club – and Bob had to prove that the cheque was for his group!)

The first step was to design the dome. Many ideas were put forth, but in the event, Bob Nelson – during the Christmas holidays – purchased a used 18' silo dome from a distributor in Abbotsford and hauled it back to Prince George on a U-Haul trailer in the dead of winter. It needed to be reconditioned. A great place to work was at hand – the then cavernous, unfinished third floor at the College. Although somewhat dusty (it was used by people as a running track!), it proved an ideal workspace. Panels were cleaned and painted; clamps, nuts and bolts located; and the dome erected.

That spring (of 1980), the newly minted Prince George Astronomical Society received its charter from the B.C. Government.

By our very good fortune, Mr. Ed Loerke, then the technician at the physics lab (where Bob taught) was willing – with the aid of a summer student, Bob Sedlock – to do the necessary work to convert the silo dome to an astronomical dome. The Mt Palomar style of shutters (bilateral; opening sideways) was rejected out of hand (in winter, snow would fall in on the telescope). Rather, the 'up and over' style was chosen. Therefore, Ed needed to do two things: Make a base ring to support the dome; and design and fabricate two arches to accommodate the shutters. For the former, we had planned for the longest time to get a rolling mill in Edmonton to bend angle iron inwards (the 'hard way'); however, Ed cleverly fabricated the ring himself from rolled 'flat bar' and horizontal segments. The whole thing was laid out on the floor of the CNC welding shop and welded together by Ed.

Next, the arches were made. A box structure was designed and welded together by Ed, also at the CNC welding shop. Then, the base ring was laid out in the CNC parking lot, the arches propped up and panels attached. The work was harder than one might have thought, due to the very heavy (16 gauge) nature of the steel panels. Ribbed pieces needed to be bashed and bent at the edges of the 5' vertical slot that would form the opening through which we would view the heavens.

Once that was accomplished, Ed and his helper turned their attention to the shutters. More than one was required because the opening would need to be more than ¼ circle – the telescope needed to be able to point straight up! Therefore, the upper shutter would be less than ¼ circle; the lower shutter – at that time – would roll down. The shutters were made by Ed welding together a lattice of 1" square steel tubing and covering each with sheet metal.

Now how would the shutters be raised and lowered? Ed cleverly got a steering-gear box from a used auto parts distributor, connected it through a universal gear and shaft to an automobile differential gear (similarly obtained) that was mounted to a base plate at the top of the dome. The shaft of the differential had sprockets at each end that engaged a chain welded to the upper shutter. An old car steering wheel at the bottom completed the arrangement.

Only 70 rotations (by hand!) were required to open or close the upper shutter. The lower shutter initially rolled down; this was controlled by a similar ingenious mechanism designed and built by Ed.

The dome was completed by the end of the summer of 1980. There it sat for the next four years.

The telescope 'tube' was fabricated the following winter. It consisted of a 36" x 36" x 24" box made of ¼" steel; it also had internal braces to make the interior the shape of an octagon. Attached to the upper part were eight heavy-wall pipes in a triangular truss arrangement that supported a heavy steel ring at the top. (Further posts parallel to the axis lengthened the 'tube'; they supported a ring – wood this time! – that would be at the end of the tube.

Over the next couple of years, Eric Hoogstraten – then in science at the University of British Columbia – designed the telescope mount. In order to preserve the ability to mount instruments at the back of the telescope, the German equatorial configuration was chosen (over the equatorial fork design). A long polar axis ensured that the telescope could track through the meridian without the need to 'flip'; it could in fact rotate through more than 360°, although to do so would mean that the cables – which would be passed through a hollow main axis – would be twisted and stressed.
At last, the plans were ready! They were passed along to the welding instructors at the College (principally Mr. Bob Martin) who oversaw the work that was to be done by the welding students as part of their 'project time'. The base was very heavy (perhaps overly so!) – it was made from 1" steel in a complicated structure. The main bearing assembly – to point up at 54° to the north celestial pole (where it is here in Prince George) -- was made from a 5' section of 12" heavy walled pipe. This pipe was too large to machine in the CNC millwright shop; instead it was machined at a local shop – QM Machine Works.

The bearing holders – to be inserted at each end of the 12" pipe – were welded and machined by millwright students. Then our difficulties started. The problem was that we did not have precision calipers large enough to measure the pipe and inserts. We thought they were right and tried to install them. We heated the pipe, dropped in an insert, which then went about half-way in. We made the big mistake of trying to hammer it home. You guessed – it got stuck!! Now what to do? It was jammed solidly.

In the end, we got a hydraulic jack (capable of exerting a force of many tons) and extricated the insert. Phew!! We dodged a bullet (as we would say nowadays).

Needless to say, we were a lot more careful the next time; we machined a lot off the inserts, super-heated the pipe and installed the inserts safely.

Now it was on to the two axes. We were lucky with the bearings -- a friend at an undisclosed railway company obtained a surplus set of 4 ¼" ID bearings for each axis: tapered roller bearings for the main (RA) axis and ball bearings for the secondary (declination) axis. They were ideal for the purpose.

Bob machined the main (hollow) axis and the whole arrangement was assembled in the spring of 1983 (?). It was then on to the declination bearing box. It was also fabricated in the welding shop by students; the flange was machined by a millwright student. The (solid) steel declination was mounted and the long-idle telescope 'tube' was finally attached to its mount in the spring of 1984 (?).

In the meantime, the optics were manufactured. Somewhere along the way, the aperture was increased from 20" to 24". The two-mirror set was to be in the classical cassegrain configuration. That is, the light from the star hits the concave 24" primary, is reflected back towards a focal point some 2.4 metres back up. However, a convex 8" secondary mirror reflects the rays back through a hole in the primary towards a focal point behind the main mirror. Because the rays after they strike the secondary are at shallower angles, the overall effect is to increase the focal length of the system to some 7.2 metres. This makes high magnifications possible.

The mirrors arrived at the College on -------
---- to be continued