PeGASus

Newsletter of the

Royal Astronomical Society of Canada: Prince George Centre

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September, 2011

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

PeGASus

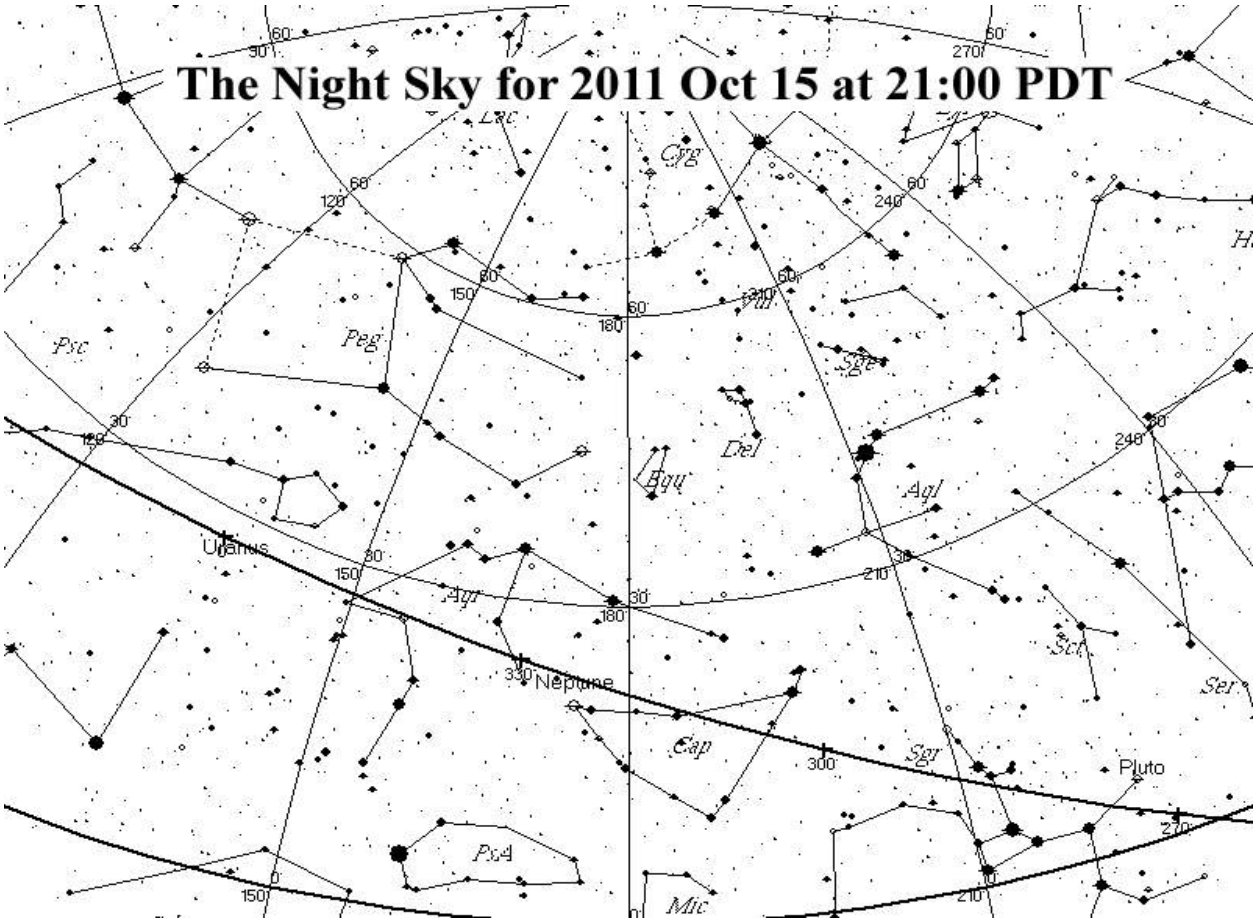
Newsletter of the
The Prince George Astronomical Society

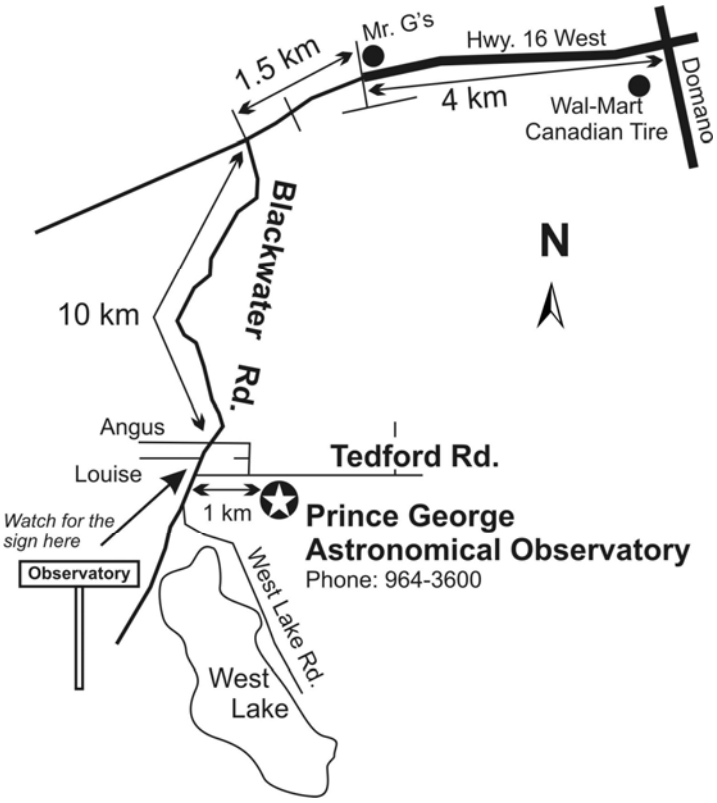
In Issue # 184

Annual General Meeting
October 15, 2011 at 6:30 pm
At the Observatory

Very important you attend , our grants are determined in part by the attendance at the AGM. Please join us, Pizza at 7:00

Coming Events– Page 2





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Contributions to the newsletter are welcome.

Deadline for the next issue is October 21, 2011

PeGASus Editor
Gil Self
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Coming Events

To Volunteer to help run an event please leave A message At the Observatory 250-964-3600

Date	*Event*	*Time*	*Place*	*Volunteers*
October 15	Business Meeting	5:30pm	observatory	Members welcome
November 5	Lunar Marathon	7:30 pm	observatory	Members welcome
Every Friday	Open house	7:30 pm	Observatory	Members welcome

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

www.rasc.ca/princegeorge

Editorial

By Gil Self

Sometimes when I get to this page I am stalled , sometimes for some time. (I just know there is something very wrong with that sentence). I know this isn't the Vancouver Sun, and this is called Editorial but it's not a page for in depth political analysis or a place for comment on world events. No this is a page to let you know about developments or plans for our club. So sometimes (there's that word again) it seems like I am writing the same things again and again. But that's not the case this month, this month there is big news. We are finally finished the upgrades on our scope. Earlier this year I was helping Bob Nelson on the work the scope needed, because of some personal matters I was slowing him up. I put out a call for a replacement and Glen Harris stepped up. Glen and Bob worked most of the summer on a long list of repairs , changes and up grades. The work was done to the highest standards, nothing was half done or left "good enough". This is probably the first time since the scope was built that there is nothing that we are "making due'.

Even though the original drives were quite amazing , they had problems. The original drives were homemade clockwork marvels. Shafts silver soldered together and allowed for tracking for a limited time. They were modified with a motor and we still had intermittent bogs and skips. I don't exactly remember the early sequence all that well but I do remember we were glad to have anything so no one really complained but there were issues and things were always in a state of modification or repair. Fact , is , I don't have to go back twenty years , anyone that has used the scope in the last five years knows the drives sometimes had a head of their own, even since the installation of the new servo drives the still intermittently gave use grief. I don't think we will see those issues any more. Some of the details that Bob and Glen cured this summer should put an end to those problems once and for all —I'm optimistic. The long awaited flip mirror assembly was also one of the projects tackled this summer and that rig is now in and functioning, I am looking forward to shooting some tri-color images when we get the filters needed. There is a long list of fixes and upgrades detailed in Glen's article starting on page six , have a look , a very interesting story.

What follows has nothing to do with astronomy. The comments in the following paragraphs represent my opinion only and are not the opinion of the astronomical society.

We all have our monthly obligations and I like you keep a pretty close eye on the utility expenses . I have been following the controversy on smart meters for several weeks now with interest. While I have my own opinion about smart meters that's secondary to my first gripe. If you pull out your Hydro bill and take a look its probably a lot like mine, the amounts will vary but I am curious if yours show the same issue as I relate to you here. You will notice that power is billed at two rates, the second rate is about 50% higher than the first rate. This is probably seen as a conservation measure and generally given acceptance as a good thing. I think its just a way to charge more on our power bills. The break point is almost exactly my monthly consumption., so for the second month I'm charged at the fifty percent higher rate. I guess it could be calculated over one month or three months —or two months. But if it's a measure to encourage conservation lets make it a target that's achievable. If your break point is close to your monthly consumption than your in the same boat I'm in. If its truly a conservation measure than calculate it over one month and make the break point a little less than my consumption, something I can try and achieve. When its half of my two month consumption there's no way I can cut my power by half so you don't even try. By making it something un-achievable than it starts to look like its just a way to make more money on the monthly bill
I'm no expert on the review process but I wonder if this two tier rate structure was sold to the people that review our rate structure as a conservation measure, because its not. Anyway I guess Ill just go on paying this but it struck me that if the rate changes at about the one month point, whose benefit is this two month billing system anyway, I'd rather have a reading every month , have the two tiered power rate applied over one month and pay my bill once a month, thank you very much.

That leads me to smart meters. Its too bad that all the press went to the slightly frantic concerns about getting cancer from your smart meter, that's not going to happen. So the real questions did not get asked or answered. One of the real questions is , "what's in it for me"? I don't see any real benefit for me, they say in the handouts that its more accurate, but in the same brochure it says that the government requires meters that are within one percent accuracy. Well if the mechanical meter as required by the government is within one percent accurate, how much more accurate an the new meter be, a half a percent , that's just silly.. No I don't see them spending millions of dollars converting meters to benefit me, not likely. No I think what we will see is a much more accurate measure of the power we are using between 4:00pm and 7:00pm for instance and by gosh we are going to charge you more for that because that's when everyone else is using power—-huh? So what, supply and demand you know , now pay up and stand aside, —next!

This just my rant, but if you think your paying too much, let me know, or if you think I'm all wet and the pricing is as it should be , let me know—I'm curious.

The Night Sky for October 2011

by Bob Nelson, PhD

Hi Folks,

As I write this, I am at the Dominion Astrophysical Observatory (DAO) near Victoria on the twelfth night of my three-week observing run. This is the longest run I have ever had, and—to be frank—was a little daunting at first. To keep my sanity, I have allowed myself some recreation by paddling in my kayak in the ocean and lakes from about 16:00 to 18:00 or so, arriving back at the observatory before sunset.

I then scramble to get ready. The first task is to fill the dewar (vacuum flask) surrounding the CCD chip with liquid nitrogen (the -110 ° C temperature bashes down the dark current to almost zero). If the chip is at room temperature, it takes about 10-15 minutes to cool the chip to a useable temperature; I need to fill it one or two times during the night. The next task is to get the telescope ready. Usually, it works just fine, but sometimes there is a failure. Over the years I have learned a number of tricks to solve problems, but once in a while there is a new kink. I then have to phone the resident observer or technician, hoping that it is not too late at night.

I usually have made an observing schedule in advance. It, however, changes when necessary in response to the data I am getting.

I usually eat supper in the warm room when time permits during the ½ to 1-hour exposures. I work hard all night reducing data and making plans. I usually get to bed at 06:00, sleeping until 15:00. What a life!

As most of you know, I study eclipsing binary star systems. (These are systems of two or more stars–usually two–that are in orbit around the common centre of mass. If the inclination is high enough (i.e., close enough to 90°. 0° is flat with the plane of the sky.) then we see a dip in the light intensity as one star passes in front of the other.)

At the DAO, I take spectra that enable me to obtain radial velocities (i.e., in the line of sight) that are caused by the relativistic Doppler effect. If I get a set of full radial velocity curves and also the light curves, I will be able to solve for all the system parameters (mass ratio, inclination, temperatures, stellar radii and orbit size). This solution is of value to astronomers studying stellar evolution.

.Anyway, I have had a wonderful observing run so far—clear skies every night—and almost 100 science spectra obtained. However, the weather seems to be turning, with cloudy skies at the moment and perhaps for the next 4 or 5 nights. I may drive home early.

Anyway, here is what is happening in PG skies next month.

MERCURY is an evening object this month. The little planet is working its way around from the far side of the Sun, reaching greatest eastern elongation next month on Nov 19th and inferior conjunction on December 3. It's pretty much in the "blob" stage (waning gibbous), only 5" in diameter. Its elongation increases from 2.8° on the 1st to almost 20° on the 31st. It will get dimmer, from magnitude -1.4 on he 1st to -0.3 on the 31st. Unfortunately, due to the inclination of the ecliptic, it's an unfavourable apparition for northern observers and lies only a degree or two above the horizon at sunset..

VENUS is an evening object this month. Venus too is working its way around from the far side of the Sun. It is also in the gibbous phase, but is a much larger 10" in diameter and brighter, at magnitude -3.9. Its elongation from the Sun increases from some 13° on the 1st to 20° on the 31st. It too presents an unfavourable apparition for northern horizon, lying only about 4° above the WSW horizon at sunset.

MARS, in Cancer until October 18, after which it passes into Leo, is a morning object this month. On the 15th, it will rise at 01:05 and lie some 51° above the ESE horizon at sunrise. It will be a 5" disk of magnitude 1.2.

JUPITER, in Aries until December, is mostly visible all night this month. On the 15th, it will rise about a half hour after sunset, make a transit at 01:58 and lie some 12° above the western horizon at sunset. It's a 49" disk of magnitude -2.9 this month.

SATURN, in Virgo until late 2012, is lost in the glare of the Sun this month, making a conjunction on Oct 13.

URANUS, in Pisces until next March, is an evening object this month. On the 15th, it will lie 4° above the eastern horizon at sunset, will make a transit at 23:41 and set at 05:48. As usual, it's a 3.6" disk at about magnitude 5.7.

NEPTUNE, in Aquarius all decade, is an evening object this month. On the 15th, it will lie some 10° above the SE horizon at sunset, make a transit at 21:37 and set at about 02:33. As usual, it's a 2.3" disk at about magnitude 8.0.

CONSTELLATIONS to look for in October (at 9:00 PM, PDT) are Pisces Austrinus, Capricornus, Aquarius, Delphinus, Vulpecula, Equuleus, and Pegasus.

Pisces Austrinus (PsA, "The Southern Fish"), visible only on the extreme southern horizon here in Prince George and lying as it does off the Milky Way, contains only a few galaxies and no star clusters or nebulae. It does contain the well-known star Formalhaut (= Alpha PsA = Al Rischa, "The Cord"), the 18th brightest star in the night sky. It is a fine binary star, discovered by William Herschel in 1779. The galaxies visible are NGC 7172 and 7154 but these are very, very close to the horizon when on the meridian and represent challenge objects from here.

Capricornus (Cap, "The Sea Goat"), lies on the Zodiac but lies out of the Milky Way (to the northwest of PsA) and contains only M30, a fine globular cluster. Of the brighter stars, Delta and Epsilon are both variable stars. Delta is an eclipsing binary of the Algol type (fully detached, with flat regions in the light curve between eclipses); its period of 1.023 days makes it hard to study. Epsilon is a variable of the Gamma Cassiopeia variety. These are young stars that are rapid rotators; in fact, they are rotating so fast that the star's gravity is only just strong enough to retain the stellar material. With instabilities, material gets ejected every once in a while, resulting in irregular light variations and emission lines in the spectra.

Aquarius (Aqr, "The Water Bearer"), to the north of Cap, lies on the Zodiac and contains a number of variable stars but no deep sky objects (!) -- at least as listed in Norton's Star Atlas.

Delphinus (Del, "The Porpoise"), to the northwest of Aqr, is another boring little constellation, containing only two globulars, NGGs 6394 and 7006.

Vulpecula (Vul, "The Fox), in the Milky Way just to the south of Cygnus (and the last constellation in the book), contains M27, the famous "Dumbbell" Nebula (disc'd by Messier in 1764 and lying close to 900 light years from us) -- it's a wonderful object worthy of close observation or CCD photography (just wait til we have colour filters available).

Equuleus (Equ, "The Little Horse"), a tiny constellation (the second smallest in the sky, after Crux) and contains NO deep sky objects at all. Delta Equulei, however, is a close visual binary. It was discovered by Otto Struve in 1852; it was for many years at period 5.7 years, the shortest known for any visible binary. According to Burnham, the system has made 19 revolutions in the last 112 years. It is, however (as you might expect) a difficult close binary, never separated by more than 0.35 arcseconds.

Pegasus (Peg, "The Winged Horse", "The Great Square" and our mascot), also lies off the Milky Way. It contains a few faint galaxies, an open cluster, and M15, a fine globular.

Best wishes to all,
Bob Nelson

Mission Accomplished

Much time, effort, and a lot of money was spent during the summer months, bringing to fruition the mission started nearly ten years ago to improve the 24" telescope to the point where it could be used to its full capacity as a research grade telescope.

The most important element of any telescope is the quality of the mirrors. To this end, the 24" primary mirror and 8" secondary mirror were sent off to be evaluated, touched up, and recoated. It has been many years since the main mirror was coated and the secondary mirror's surface was obviously quite poor. With the mirrors' reflectivity renewed, great views of the night sky are expected once the mirrors have returned from the restorer. It was a difficult decision to send the mirrors off just as the fall viewing season began, but as the funds had just become available, the decision was made not to wait until we closed for the winter or possibly even next summer. We anticipate that the telescope will be back in service by the end of September and performing better than ever.

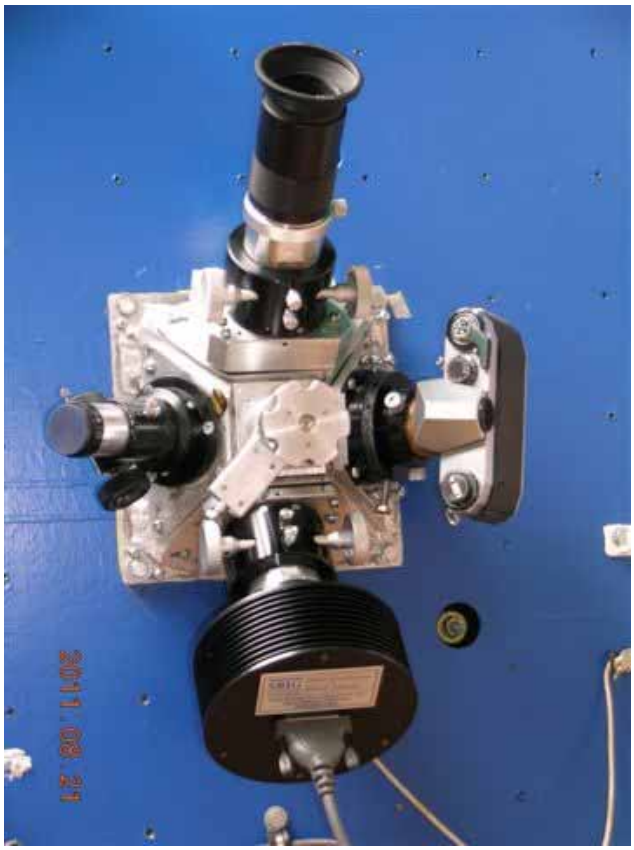
As volunteers worked towards improving the mechanical operation of the telescope, several problems were identified and resolved, not the least of which was consistent operation of the flip mirror assembly.

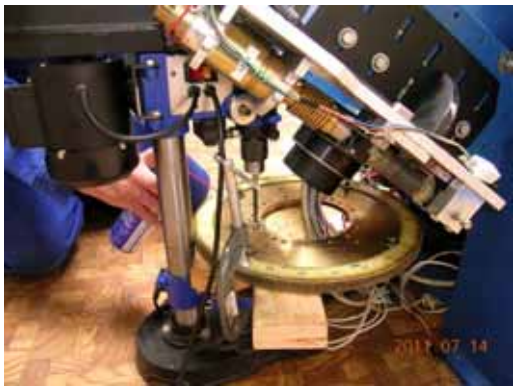
This manually operated assembly holding the secondary mirrors allows a user to choose how to use the telescope. The f12 Cassegrain mode lets a person use the telescope visually, and to date has been very popular with both members of the Centre and the general public. Choosing the f4 Newtonian option permits an operator to use the new SBIG ST-10XME CCD camera and CFW9 colour wheel to photometrically capture and accumulate scientific data, and photographically to capture colour images of the universe.

The problem with the flip assembly was the inability to consistently return exactly to its previous position, something vital to maintaining collimation in both Cassegrain and Newtonian configurations. To solve the problem, machined tapered homing plates were used to replace the original equipment.

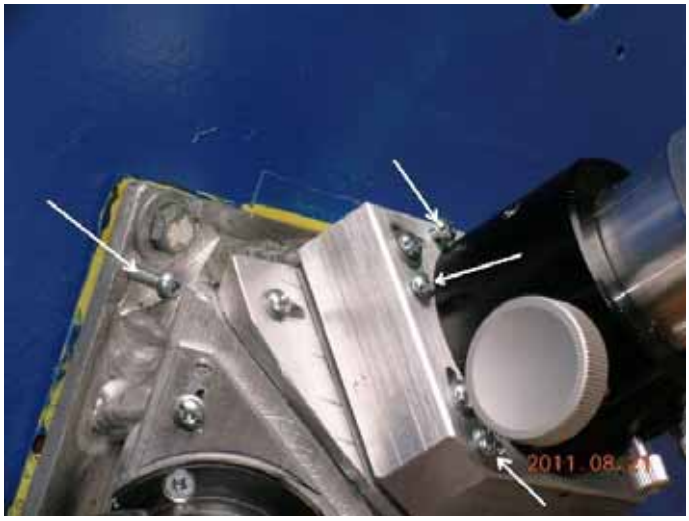
Moving along the light path from primary mirror to secondary mirror to the eyepiece, the next order of business was to replace the diagonal mirror. This is a flat piece of glass mounted to a mechanism used to select, via the central knob viewable in the accompanying image, one of the four viewing ports available on the rear of the mirror box.

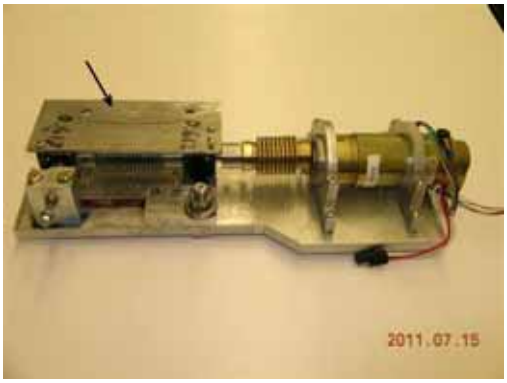
Each of the '4shooter' locations needed to be precisely aligned to gain the maximum effect of the reflected star light. Not all the time spent working on the telescope improvement project was logged at the observatory. Bob spent many hours in the CNC Physics lab basically rebuilding the original '4shooter'. Adjustment screws installed on the 4shooter base and at each port allow for precise alignment of the optical device being used. The top port holds a selection of 2" or 1 1/4" eyepieces. For anyone interested in taking photos with a 35mm camera, the right hand port can be used. The bottom port is reserved for the ST6 CCD camera. The 1 1/4" focuser located in the left port will be replaced with a 2" focuser and used in conjunction with a spectrograph, now at the preliminary design s





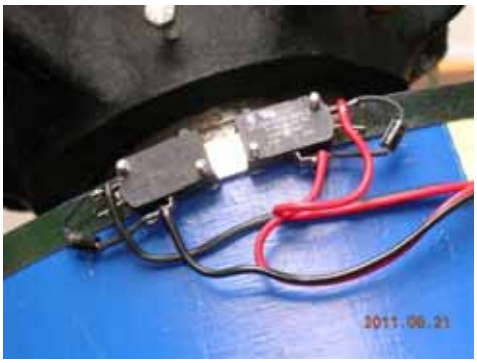
To remedy the issue of inaccurate RA gear plate to worm gear alignment resulting in binding and excessive gear tooth wear, the RA motor assembly was retrofitted with a calibration plate. Using this plate and a set of calipers, the angle of contact can be precisely set to ensure correct meshing of the RA plate teeth to the worm gear. The distance requirements are displayed on the plate for easy reference.





As the troubleshooting procedure continued, a problem plaguing the telescope for quite some time, that of poor slewing and tracking performance, was attributed to four different causes. It wasn't until a micrometer was used to measure the tolerances of the right ascension (RA) gear plate and drive worm that it was found there was a 0.0030" vertical variation where the gear plate meshed with the drive worm. This caused the gear plate and drive worm to bind in certain positions of telescope rotation. The solution to this problem was to drill and tap many holes in the RA plate to allow shimming bolts to be used to align the plate.

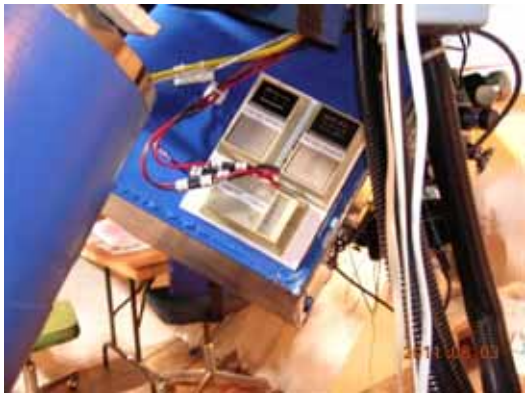
The third problem was attributed to an RA mounting bolt that had worked itself loose and was causing the telescope to surge while slewing, to the point that the servo controller sensed a problem and shut the motors off.



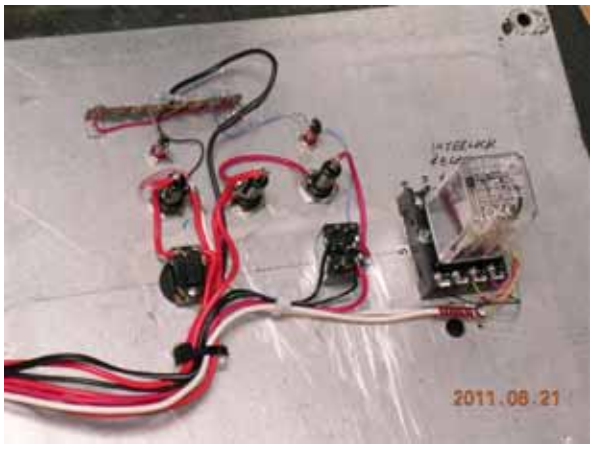
The final problem encountered was that of balance. Once all the peripheral equipment was mounted to the telescope, the RA and Declination gears were disengaged to allow free telescope motion in all directions. Counterweights installed and positioned in the proper locations allowed the telescope to be precisely balanced in X, Y, and Z axis.

The declination limit switches used are the mercury switch style of thermostat. These controls limit how low the telescope can be moved, and also prevent the telescope from being inadvertently 'flipped' during a viewing session.

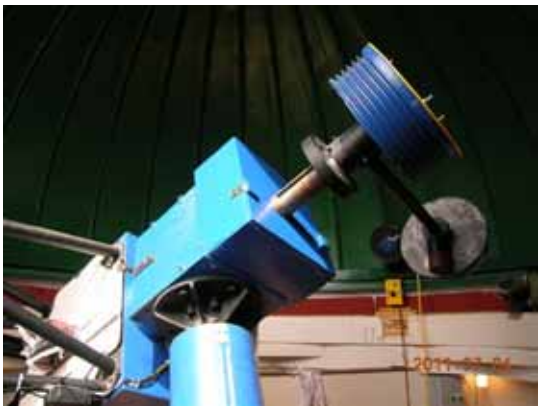
To prevent damage to the telescope, limit switch circuits were designed and installed. The RA limit switches mounted on the axis tube prevent the telescope from continuously rotating, a situation that would damage the cables running up the centre of the axis tube to the wiring panel. A feature built into the RA movement is a limit switch that prevents the telescope, if left unattended, from impacting the stairwell wall.



Another safeguard employed is the addition of sensing relays into the power supplying the servo controller and the viewing deck pier boxes. If any of these 12 Volt DC supplies is left energized, the building alarm system can't be activated.

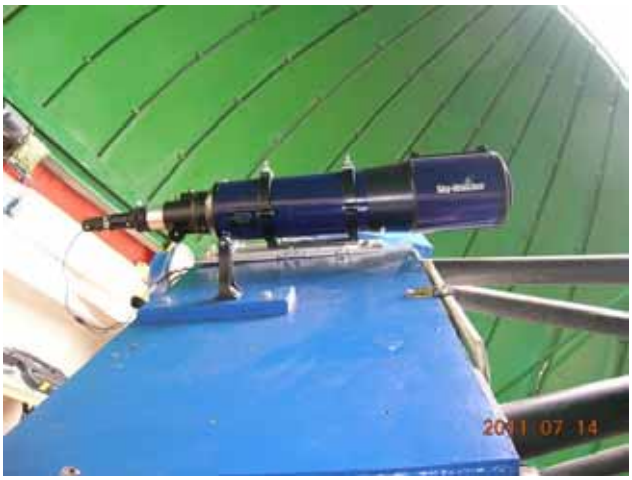


Preventing foreign material from accumulating on the Declination gear assembly was accomplished by building a plywood enclosure. Painted to match the telescope, the enclosure blends in well with the rest of the structure.



To help with the initial telescope calibration process and assist in locating viewable objects, a 6" refractor telescope was 'piggybacked' onto the 24" mirror box. Equipped with a black and white, surveillance type low light level camera, images of the night sky are transmitted to a small monitor in the dome. To enhance the visiting public's experience at the observatory, live images can also be sent to the classroom for display on the wall.

Although current test images of deep sky objects are rather poor when projected on the classroom wall, views of the moon are acceptable. As funds are acquired, this function will be improved by using a larger aperture telescope and a more sensitive colour camera. When this is achieved, it will also be possible to simultaneously send quality images to the internet where they can be seen on sites catering to on line observatories.



Thanks to the work of many dedicated volunteers spanning several years, the 24" telescope is no longer limited to visual viewing. Centre members can now use the telescope to search for supernovae, precisely measure faint comets and asteroids, observe and document occultations, and once scientific filters are in place, record the light curves and spectra of very faint eclipsing binary stars and take long colour exposures of faint deep sky nebulae and galaxies.

Submitted by:
Glen Harris

Discover the Universe – À la Découverte de l'univers !

By Pamela den Ouden

In May 2011, I saw an announcement on the RASC web site about a three-week video-online astronomy course being offered jointly through the Fédération des Astronomes Amateurs du Québec (FAAQ), the Canadian Astronomical Society (CASCA), and the Royal Astronomical Society of Canada (RASC). The purpose of the course was to introduce participants to the summer sky, the reasons for the seasons, constellations, and other topics celestial to prepare them to teach a camp group, an adult interest group, or work in an interpretive centre. The catch? It was all in French!

Undaunted, I registered. My French is okay—my reading and writing levels are quite good, my speaking level, not quite as good, especially about technical topics, and my listening—well, that's always the hardest part of learning a language!

For weeks before the course, I sussed out French-language astronomy sites, checked things out on the French Wikipedia site, learned some astronomical vocabulary, and tried to get a handle on the French names of constellations and planets with which I was already familiar.

There was such interest in the course that two groups were set up. My group of 16 people met from 5:30-6:30 p.m. (Pacific Time) for three Thursday nights in June. That meant three hours later for most of the other participants, who were in Ontario or Quebec. Our fearless leader was a wonderfully knowledgeable and personable teacher, Julie Bolduc-Duval, the education and outreach coordinator for the Discover the Universe project.

On the first Thursday, I sat nervously in front of my computer, the small video at the right side of my screen, along with chat boxes so participants could respond in writing to questions, "raise a hand" to ask a question, or make other comments. When Julie began to speak, all my fears were realized! Could she have spoken any faster? No! The words tumbled out of her mouth at the speed of light! I'm sure I caught only every 10th or 20th word! Fortunately, we could replay the video portion as often as we liked.

One thing that amazed me about the course was the caliber of knowledge among the participants. The minute a new topic was mentioned, the chat box started filling up with alternate wording, links to pertinent web sites, questions, and further suggestions to expand our knowledge. Among the group were two PhD candidates in astrophysics directors of institutes, heads of departments, Masters of Science, national science program coordinators, and then there was me . . . I think I was the only anglophone in the group and maybe the only person who wasn't "somebody" in the world of astronomy. In my introduction to the group, I did mention my affiliation with the RASC Prince George Centre! It gave me some legitimacy!

The course was divided into three sections. Each lesson had an excellent handout which participants accessed online. The first lesson was about the circumpolar constellations: the Big Dipper (an asterism, part of Ursa Major), the Little Dipper, Cassiopeia, Cepheus, and other stellar friends. Each participant in the course had to write a "guided tour" of a constellation, in French, of course. I chose to write about Cygnus. We had to include information on the mythology surrounding the chosen constellation as well as tell about an interesting scientific aspect of the constellation. Finally, we had to share any web sites or books or other resources we had used in researching our project. I worked hard on my tour guide and was the first to submit to the web site! My strategy was to make up in enthusiasm what I might have lacked in language skills and sky skills!

The second lesson focused on the constellations of the Summer Triangle. Already being familiar with the summer sky gave me some confidence. I felt I knew something, even if it was only in English! In this lesson, we also had a virtual treasure hunt. We had a list of instructions to go to various astronomical web sites and find particular information from each site.

The third week focused on the constellations in the western sky, the phases of the moon, and a lunar observation journal. One of the great resources that the course introduced me to is Stellarium. You can download this free open-source planetarium software at www.stellarium.org. A French version is available at www.stellarium.org/fr.

We so take for granted our ability to express ourselves and our knowledge in words, but moving that knowledge into another language is fearsome but awesome. I am glad I participated. I challenged myself, worked as hard as I could, and benefited from the experience!

Sound like a great course? It was, but relax! I think the plan is to offer the same course in the spring of 2012—this time in English!

For more information about upcoming courses, please contact Julie Bolduc-Duval, Discover the Universe Project Coordinator, at julieboldducduval@gmail.com.

Royal Astronomical Society of Canada

Prince George Centre

AKA the ***Prince George Astronomical Society***

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