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Journal

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Journal

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ACROSS THE RASC
DU NOUVEAU DANS LES CENTRES

Editorial

by Jay Anderson (jander@cc.umanitoba.ca)

Let me catch my breath.

OK, there. I'm ready to take on the Editor's job. Wayne Barkhouse, the departing Editor, is leading me by the hand, contributions are arriving somewhat steadily, and the rest of the *Journal* staff is standing by, giving me advice and comfort and a lot of their hard work. I've talked to the RASC discussion list and received a bunch of hints and no consensus. But everyone seems to be willing to let me have a go.

In my mind, amateur astronomers come in four flavours, a distinction that is not unique to astronomy. There are equipment makers and equipment users, both knowledgeable and admired. There are the armchair astronomers who are content to read about it and attend the local meetings and perhaps look through a telescope when an easy opportunity presents itself. Some of them are very well informed and a professional article here and there only whets their appetite. And then there are organizers, the ones who make up the body politic of the RASC, and absolutely essential for the rest of us who have no time to make the RASC work. There are crossover members — people who both make and use their telescopes or a member of the Council who does dynamite astrophotography. But mostly one skill dominates and the others take second place.

This *Journal* has to have something for all of us.

I'm a passionate believer in the science of astronomy, of amateurs doing science, and I'm seeking people who can tell us how to do things that are scientifically challenging — challenges such as spectrophotography, asteroid light curves, variable star observations, and novae light curves. To please the builders and users we'll go after new advances in single-shot colour cameras and image processing and members' observatories and telescope projects. For the armchair astronomers and the visual observers, we'll put articles about the sky— planets, nebulae, Sun, and Moon — and we'll illustrate them with drawings and photographs so that you see what our contributors see. And for the organizers, we'll continue to report on Society affairs and Society programs and Society people.

The *Journal* will continue with peer-reviewed articles because peer-reviewed science gives the JRASC a cachet that makes others want to write for us. If you can't understand the articles, we'll try to help out, but don't write us off, because there will be something else for you on the next page. Right from my first day I found that I could write strangers and ask them for a contribution and they agreed because the RASC and the JRASC have a special place in amateur astronomy.

We have something pretty good. We are going to keep it that way.

Journal

The *Journal* is a bi-monthly publication of the Royal Astronomical Society of Canada and is devoted to the advancement of astronomy and allied sciences. It contains articles on Canadian astronomers and current activities of the RASC and its Centres, research and review papers by professional and amateur astronomers, and articles of a historical, biographical, or educational nature of general interest to the astronomical community. All contributions are welcome, but the editors reserve the right to edit material prior to publication. Research papers are reviewed prior to publication, and professional astronomers with institutional affiliations are asked to pay publication charges of $100 per page. Such charges are waived for RASC members who do not have access to professional funds as well as for solicited articles. Manuscripts and other submitted material may be in English or French, and should be sent to the Editor-in-Chief.

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News Notes
En Manchettes

by Martin Beech, Regina Centre (beechm@uregina.ca)

PUZZLING LIGHT VARIATIONS

Brightness variations in the small ageing star PG 0101+039 have recently been discovered with the Canadian MOST (Microvariability and Oscillations of STars) satellite. The new results were described at the Canadian Astronomical Society meeting held at the Université de Montréal this past summer, by Suzanna Randall and Prof. Gilles Fontaine (both of the Université de Montréal), Prof. Jaymie Matthews, Jason Rowe, and Dr. Rainer Kuschnig (all University of British Columbia), and the international MOST Science Team. The confirmed variability of the star is of particular interest because it violates predictions of stellar pulsation and will force a thorough reconsideration of current theory.

PG 0101+039 is a subdwarf B star located in the constellation Andromeda at a distance of around 1000 light-years. Its brightness fluctuations were observed for nearly seventeen consecutive days starting on September 28, 2004 with MOST, Canada's first orbiting space telescope. Around 250 times less bright than the dimmest star visible with the naked eye, the star is relatively faint for the 15-cm (5.9-inch) telescope designed primarily to look at much brighter objects. The fact that minuscule luminosity changes of less than 1% of the star's normal brightness were nevertheless detected constitutes a significant achievement and holds great promise for the future space-based exploration of subdwarf B stars.

Subdwarf B stars are around five times hotter than our Sun, and so dense that - at comparable masses - they are about ten times smaller. They are rather abundant in the nighttime sky and

The complete MOST light curve obtained for the subdwarf B star PG 0101+039 over 16.9 days starting September 28, 2004. Each data point corresponds to the relative brightness of the star at that particular time. The top row covers the first 24-hour period of the run, and the data for subsequent days have been shifted downwards arbitrarily for visualization purposes. Image courtesy Université de Montréal and MOST.

dominate the population of bright blue stars. While astronomers know that they are in the final stages of their long lives, the details surrounding their evolution remain somewhat mysterious. Following the discovery of pulsating subdwarf B stars, it is now hoped that evolutionary theories can be constrained through the use of a technique called asteroseismology. Analogous to seismology on Earth, asteroseismology is essentially the study of "starquakes," seeking to match the brightness variations observed in a star to those predicted for a particular model and thus determines its temperature, size, and chemical composition. "Asteroseismology lets us probe deep inside stars to reveal their internal composition, an aspect that normally remains hidden even from the world's largest telescopes," explains Suzanna Randall, an astronomy Ph.D. student at the Université de Montréal. "The asteroseismological potential of pulsating subdwarf B stars in particular may hold the key to a more mature comprehension of the evolution, life, and death of stars. While the detection of oscillations in PG 0101+039 challenges our current models, it will ultimately lead to a better understanding of these valuable objects."

The MOST mission was financed by the Canadian Space Agency and supported by the Natural Sciences and Engineering Research Council of Canada.

2005 PLASKETT MEDAL

Christian Marois has been awarded the 2005 Plaskett medal. The award is offered to a doctoral graduate from a Canadian university who is judged to have submitted the most outstanding thesis in astronomy or astrophysics in the preceding two calendar years.

The award, a gold medal, is bestowed jointly by the Canadian Astronomical Society (CASCA) and the Royal Astronomical Society of Canada (RASC) in recognition of the pivotal role played by John Stanley Plaskett in the establishment of astrophysical research in Canada. The laureate is also invited to address one or the other of the sponsoring Societies (at his or her choice) at their Annual Meetings and to prepare a review paper to be published in the *Journal of the Royal Astronomical Society of Canada*. During his undergraduate years at the Université de Montréal, Christian Marois was involved in research on globular

clusters with Professor René Racine and Dr. Howard Bond (Space Telescope Science Institute, Baltimore, MD). After graduating, Christian Marois completed his M.Sc. and Ph.D. studies at the Université de Montréal in exoplanet research under the supervision of Dr. René Doyon and professors Daniel Nadeau and René Racine. His doctoral thesis, entitled "*La recherche de naines brunes et d'exoplanètes: développement d'une technique d'imagerie multibande*," is based on data obtained with a camera built by Dr. Marois and designed expressly to take simultaneously three images of the same field at adjacent wavelengths in the infrared. The contrast between the spectrum of a star and that of a cool substellar object, due to methane absorption in the atmosphere of the latter, provides a way to search for faint companions around nearby stars through accurate subtraction of the starlight in the observed images. The main result of the thesis is a much-improved understanding of the differential aberrations between the images that paves the way for next-generation instruments with expected orders of magnitude increases in sensitivity. The thesis includes the conceptual design for such an instrument, where spectral separation of the starlight is done on a pixel scale in the focal plane of the image.

Over the course of his studies, Christian Marois has received several awards and fellowships from the Université de Montréal, the Fonds québécois de la recherche sur la nature et les technologies (FQRNT), and the Natural Sciences and Engineering Research Council (NSERC). He is currently pursuing his research at the Lawrence Livermore National Laboratory (Livermore, CA), building an advanced high-contrast imaging instrument and using the Gemini 8-metre and Keck 10-metre telescopes to search for brown dwarfs and exoplanets.

CHAMPION METEORITE FINDER CREATES PUZZLE

A new iron meteorite has been identified from Manitoba by the Prairie Meteorite Search, a project run jointly by researchers at the University of Calgary, Campion College at the University of Regina, and the University of Western Ontario. The new find by Mr. Derek Erstelle hails from near Pinawa close to the eastern border of the province. The Pinawa meteorite is the seventh meteorite to be recovered in Manitoba, and is the fourth Manitoba "find" to be identified by the Prairie Meteorite Search. The new meteorite weighs approximately 2.5 kg and is the 65th meteorite to be recovered in Canada.

Derek Erstelle found the meteorite fragment in the forest located about a half-hour drive southeast of Lac du Bonnet, Manitoba in the fall of 1998 or 1999. What is particularly extraordinary is that this is the second meteorite that Erstelle has found. Two iron meteorite fragments that he had found near Bernic Lake were identified in 2004 as representing a new Canadian meteorite. "I was inspired to look through my stored rocks for this other rock that I had found before the Bernic Lake specimens," says Erstelle. With his most recent discovery, he becomes the first person in Canada to ever have found two new meteorites. Erstelle, who is an experienced rock collector, says, "I'm just out there knocking dust off the rocks when I'm out hunting." The Pinawa meteorite shows substantial surface weathering indicative of having fallen thousands of years ago. Dr. Alan Hildebrand used the University of Calgary's UCLEMA microprobe to detect nickel in the specimen, confirming the meteorite's origin. Dr. Stephen Kissin at Lakehead University performed a careful inspection of the iron, confirming that it is indeed different than the Bernic Lake meteorites.

Dr. Hildebrand, holder of a Canada Research Chair in Planetary Sciences at the University of Calgary, was very surprised when the second meteorite from the Pinawa area turned out to be from a different source. He commented, "The meteorite looked much like the two Bernic Lake meteorites and, though found ~40 km away, I still expected them to be related. We have the makings of a puzzle here." The extraordinary thing is that two different meteorites could be found only 40 kilometres apart in forested land, where it is much more difficult to find them than on farm or pasture land. In addition, the two meteorites are more weathered than is typical for Canadian iron meteorites. Hildebrand speculates, "Derek may have located a meteorite stranding surface. Many have speculated that somewhere in Canada the continental glaciers of the last Ice Age concentrated meteorites in a manner similar to those found on the Antarctic continent today. So I checked the glacial maps, and the area east of Winnipeg where Derek found these meteorites is where two lobes of the Laurentide ice sheet met about 11,500 years ago." This theory implies that meteorites falling on the surface of the ice sheets were concentrated by glacial flow before being deposited in eastern Manitoba when the ice melted. Hildebrand continues, "Hundreds or thousands of meteorites might have been dumped by the glaciers in a small area." The theory can be tested by determining how long the Bernic Lake and Pinawa meteorites have been on Earth, and by searching for more meteorites in the region near Pinawa.

Tom Weedmark, a University of Calgary geology student and Prairie Meteorite Searcher for the summer of 2005, commented that, "The continued success of the search indicates that many more prairie residents have meteorites that haven't yet been studied. I hope that we can make this centennial year a record year for meteorite recovery in Canada."

Solar Reflections: How to Put Yourself in a Sunshine State

by Alister Ling, Edmonton Centre (aling@telus.net)

I've always enjoyed watching the Moon rise or set behind an interesting foreground, such as a cityscape. A few years ago, I was looking forward to catching a picture of the nearly full Moon setting above Edmonton's Legislature building (Figure 1), when much to my surprise and great delight, the buildings just to the north (Fig. 1, right) bloomed into a fiery mass of light. The rising Sun behind me was reflected in dozens of windows! The following article will provide you with instructions on how you can find a date and place for these events as well as some viewing and imaging advice.

Although an uncoated glass surface reflects 4% of incident light, the result is still blindingly bright, so you must guard against prolonged stares or leaving your equipment pointed at the blaze of the Sun. Don't let sunglasses fool you into thinking your eyes are safe either. Remember, the glass used in buildings is often coated and will reflect more than 4% of the light; a #12 welder's glass is recommended for minimum protection. If the air is transparent, a normal solar filter will not dim the view excessively.

Figure 1– Full Moon setting over the Legislature building, Edmonton. Photograph by A. Ling.

Reflection Geometry

To a first degree of approximation, windows can be considered flat, so the problem reduces to the straightforward geometrical pictured shown in Figure 2. β is the angle that the building (window) makes to the north. *SAz* is the azimuth of the Sun, *BAz* is the azimuth of the building from the observation point, and the azimuth is reckoned from north following common convention. Remembering that the angle of incidence equals the angle of reflection, and that the sum of angles in a triangle is 180 degrees, one can derive the following equations:

$$\beta = BAz / 2 + SAz / 2 - 180 \qquad (1)$$

$$SAz = 2(\beta + 180 - BAz / 2) \qquad (2)$$

$$BAz = 2(\beta + 180 - SAz / 2). \qquad (3)$$

These equations apply for viewing sites both east and west of the building and whether the Sun is north or south of the observer. The antisolar point, often in the picture, can be estimated from the building orientation and the building azimuth, by adding or subtracting 180 degrees to the result obtained from equation (2).

Measuring the Angles

My experience with the buildings in Edmonton is that you can reasonably estimate the angle β with a protractor and a street map, because building fronts tend to be parallel to the street. A general tourist map may not have north in the right place, so you might have to correct a few degrees. A first guess to the azimuth of the building from your viewing angle can also be made in the same way.

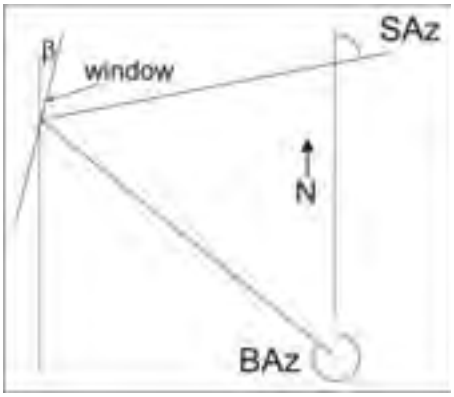

Figure 2 – Reflection geometry. The observer is located at the point from where the building azimuth *BAz* is measured. The angle *SAz* is the azimuth of the Sun.

You can increase the accuracy of the angles by taking an observation at night, using the background stars or Moon as points of reference. Remember to note the time, so that you can "plug" it into any planetarium program and generate the azimuths.

Predicting a Reflection Date

Once you have an estimate for the building angle β and the building azimuth *BAz,* use equation (2) to find the solar azimuth at sunrise/sunset. Most readers will be able to figure out a date in a couple minutes by using a planetarium program and a little experimentation. For example, if the solar azimuth is 100 degrees (south of east), try a date about a month before the spring equinox and a month after the autumnal equinox. Shift the date by a couple of days (and adjusting the time by a few minutes) until you find a match.

Generally you won't have to be more precise than a degree for the following reasons. Firstly the Sun itself is 0.5-degree across. Secondly, the windows are not perfectly flat and have a random ripple. Thirdly, the rising or setting Sun will pass through the same azimuth a couple of days on either side but at a slightly different altitude. In addition to the error of your estimation of the building azimuth, many observation points have enough space to let you move around, in effect changing the building azimuth. All told that means you typically have three days of leeway on either side of the "ideal" date.

Every time you observe a reflection, you can hone in on the optimum angles.

Reflection Behaviour

In general the following reflection and orientation rules apply:

- When you move north, the reflection moves north.
- For a fixed observation point, buildings farther north need a Sun farther north (given the same building orientation). That means a date closer to the summer solstice.
- For a specific building to reflect the Sun, as the Sun moves north, you move south

There is a subtlety worth mentioning at this point; since the windows are vertical, the observer technically needs to be at the same elevation as a building to catch a reflection right at sunrise or sunset. Each degree that the observer is below the general horizon requires the Sun to be the same number of degrees above the horizon.

Adding the Moon

When I first began my "Moon over city" project several years ago, I re-discovered what most landscape photographers know only too well - the Full Moon is considerably brighter than a twilight foreground. Although the eye may see a lovely Harvest Moon suspended over bales of hay bathed in a purple twilight glow, the film (and silicon chip) cannot acquire a good exposure for both simultaneously. As Sir John Herschel once noted, the Full Moon is every bit as bright as a sunlit grey rock in front of you.

A properly exposed, balanced picture of the Moon over a landscape requires the Sun to be above the horizon. If you must have the scene in twilight, you can of course resort to the digital darkroom, but then where's the fun and challenge in that? For a Full Moon, Terry Dickinson and Alan Dyer from their excellent book *The Backyard Astronomer's Guide* recommend an exposure of 1/60 second with an aperture of f/16 for ISO 100 film.

When will the Moon be just above the horizon at sunrise? Generally one day after Full Moon. Similarly, the Moon will be just above the horizon at sunset one day before being full. When the ecliptic makes a low angle to the horizon and the Moon is south of it, you typically get a second chance at a photograph on the next day. At high latitudes, however, that simple rule breaks down.

Since geometry extends out into the Solar System, at full phase the Moon is diametrically opposite the Sun. In order to have a solar reflection and (nearly) full Moon in the same field of view, the building orientation must satisfy

$$SAz - BAz \sim 180 \qquad (4)$$

for a sunset event, when the building azimuth is in the eastern half of the sky. Plugging this back into equation (1) yields

$$\beta \sim SAz - 270 \qquad (5)$$

For a city like Edmonton where tall buildings are predominantly oriented with $\beta \sim 0$, most of the Moon plus Sun events will cluster around the time of the equinoxes. Some readers may find that for their particular latitude and city orientation certain alignments are not possible.

Experiment with your viewing distance from the buildings. Moving closer in will allow you to see individual windows, while moving farther away means that the relative size of the Moon will be bigger. If you are 10 to 15km away, the full Moon illusion will make the Moon appear huge over the city, but remember that this will not be captured in your photographs.

Exposure Suggestions

If you are shooting with a digital camera, bracket your exposures around the metered value - electrons are cheap. On film, unless you know precisely how your light meter works (single or multiple point), you will need to try exposures 1 and 2 stops both

over and under the meter's suggestion. For example, if your light meter is receiving the full brunt of the reflection, the camera will suggest an exposure too short for the surrounding buildings. At the other extreme, if the spot metering is pointed at the background sky, then you will likely get an overexposure.

Murphy's Law

Some things will go wrong. Remember to remove the skylight filter, because it adds secondary reflections diagonally opposite the bright points. If you are stopping the lens way down, make sure the front is clean; otherwise dust motes will show up as out of focus blobs. By far, the weather is our greatest nemesis - too much cloud and you lose the event. However, just enough thin cirrus around the Sun will diffuse the intensity of the reflection and buildings on either side will light up much more. Clouds behind the buildings can add to the view by creating a bright golden backdrop, though they will usually obscure the Moon. It always seems that the weather the day before or after is perfect, just when the Moon is either too high or too low.

On one occasion, I found myself wondering if I had written down the right date, because the rising Moon was 10 minutes late. Finally I saw a pale yellow glow several degrees above the horizon, and instantly recognized the effect of atmospheric extinction. If the air is fairly hazy, the anticipated spectacular shot of the Moon rising or setting behind a building will be unimpressive.

Planning

Each building in a city's core has a specific azimuth from a particular viewing location. As soon as you have more than a couple of sightlines, the large number of solar azimuth possibilities taxes the memory. At first, therefore, I simply kept a list of when specific buildings produced reflections. However, I wanted to picture the event in my mind, so I found it useful to create a reference image for each viewing site where all the principal buildings were labeled with both their azimuth and the solar azimuth.

To find dates when the Moon would be in the right place, I used planetarium software to determine which dates and times, and which altitudes and azimuths around a Full Moon were right for a good event. With five viewing locations, this took some effort on my part. Coincidentally, one of the users of my *Lunar Calculator* software was looking for a program that would help him identify similar photographic opportunities - but he had over one hundred covered bridges in Ohio and the surrounding area to choose from. After some interchange of ideas through email, I designed a search utility that identifies when a nearly-Full Moon would be above the horizon for a user-specified solar altitude. Then the program runs through a file containing the place names of the sites and their altitude/azimuth constraints, and produces a filtered event list for only those sites where the Moon would be in roughly the right location. The search can be made across several months in a few seconds. The "lite" (free) version of *Lunar Calculator* allows a one-month search, and is available at: `www3.telus.net/public/aling/lunarcal/lunarcal.htm`.

Lastly, don't forget that the Full Moon's position relative to the ecliptic changes from month to month, and year to year, modifying its rise and set points. It will take many years before you have seen all the possibilities.

Concluding Remarks

As most readers will already know, observing a phenomenon first-hand is always more impressive than looking at a picture, and the events described here are no exception. Indeed, the classic "full-Moon illusion," where the Moon near the horizon looks bigger than usual, adds to the visual impact. While a photograph of a spectacular sunset is usually described as "very nice," those present would typically call the scene "glorious." Observing a large Moon above a cityscape that is reflecting the Sun is quite a treat. See it for yourself.

Alister Ling is a member of the Edmonton Centre of the RASC who likes to reflect on visual events from a wide range of angles.

Ancient Spirits and Dark Skies

by Ray Berg, Kingston Centre (berg3@netnitco.net)

A coyote's mournful howl drifts across the desert floor, while insects drone incessantly in the nearby sagebrush. A crescent moon has just set behind the distant sandstone mesa while above the sky is ablaze with so many countless stars that familiar constellations are no longer readily identified. The bright Milky Way stretches like a bright, billowing cumulus cloud from horizon to horizon.

This was our first night inside Chaco Canyon, in northwest New Mexico, more specifically, in Chaco Cultural Historic National Park, one of the more remote parks in the southwestern United States. My wife, Lois, and I had often talked about experiencing summer volunteer work in one of the national parks. Like many of our brainstorms, we just "never got around to it" but when a request for amateur astronomy volunteers for Chaco appeared in *Astronomy* magazine in late 2004, Lois and I conferred for less than five minutes and immediately sent off an email reply that we were available for a month anytime in the summer of 2005. Following a flurry of emails, including a "resume" of my astronomical background, we were offered an assistant astronomer position for myself and a campground host position for Lois during the month of July 2005. We immediately agreed. On June 25, 2005, we set out with our travel trailer for the journey to New Mexico.

His day job – author Ray Berg poses above some of the Chaco Canyon ruins.

The Park

Located at 1850 metres in the high desert of northwestern New Mexico, adjacent to the Navajo Nation and Four Corners region, this remote park contains major ancestral Puebloan cultural sites. These are the remains of elaborate public and ceremonial stone structures built by the Anasazi Indians between 850 and 1250 AD. Most of these buildings have a strong tie to solar and lunar positions, particularly for the dates of the equinoxes and solstices.

The remoteness of the park is due in large part to the legendary entry road, which is 26 km of dirt and washboard and acts as a natural filter, keeping away all but those visitors who are dedicated to exploring ancient Native American ruins and/or taking advantage of the pristine dark nighttime skies. Lack of food concessions, motels, and other commercial endeavours at and near the park also add to maintaining its remoteness. Still, several hundred people each day will venture a visit to this amazing park for at least a few hours of sightseeing into the ancient past. A 49-site campground accommodates those visitors wishing to stay overnight, including some who bring along their own telescopes. Lois's assignment as campground host was to meet and greet these campers and to act as the first line of contact for the park.

The park is an excellent site for astronomical viewing, and a complete observatory has been established as part of the Night Sky Astronomy Program for the public. Instrumentation available includes a 64-cm (25-inch) Obsession reflector, Dobsonian mounted on an equatorial tracking platform and located in a 4.9-metre dome, a 36-cm (14-inch) Schmidt-Cassegrain equatorially mounted on a permanent pier beside the dome, a 43-cm (17-inch) Dobsonian usually left outside and covered on one of the observing pads, and a 33-cm (13-inch) Dobsonian housed in one of the buildings. A 70-mm hydrogen-alpha refractor is also available for daytime solar viewing on the Visitor Center patio. A computer housed in the imaging building next to the dome stores images obtained with a CCD camera through the 36-cm telescope and is used to present visual programs to the visiting public.

Astronomy Volunteer Duties

Generally, three to five astronomy volunteers are available for opening the dome and

setting up the telescopes for the Night Sky Programs, arranging the public area for slide-show presentations or image shows, operating the telescopes for the public viewing and taking down equipment at the end of the evening. The volunteers also manage and maintain the observatory facilities. The Night Sky Programs are conducted three nights a week, which equates to twelve public outreach-type star parties each month, as well as setting up and interpreting the solar-telescope views to the public on the same days. The programs are very popular with the camping visitors, with attendance ranging from 30 to 100 each evening. Typical visitors include amateur astronomers, science teachers, and science-fiction fans, but for the most part consist of folks who have never looked through a telescope before and are amazed at the telescopic views of the Moon, planets (Jupiter, Venus, and Mercury during my watch), galaxies, nebulae, star clusters, and colourful double stars. We set no time limit and staffed the telescopes as long as there were viewers, into the wee morning hours - although many quit early, having hiked all day in the hot sun to explore the ruins. On one occasion, two of us set up an impromptu star party with our own telescope right in the campground.

Personal Observing

Compensation for this volunteer work included a free site for our travel trailer, a chance to thoroughly explore the ancient ruins for a month, and last, but not least, access to the observatory and its equipment at all times when it would not be in use for the public programs, plus the opportunity to use it under the wonderful dark skies of Chaco. Some of my personal visual observing endeavours included:

1) The Comet Tempel 1/Deep Impact event, occurring on the evening of July 3-4, was not on a public viewing night so we volunteers hunted down and located the comet in each of the four telescopes. This turned out to be a bit difficult because the object was getting low on the horizon at predicted impact time and appeared to be a lot fainter than we anticipated. Near the time of predicted impact, a significant brightening of a magnitude or more was suddenly noted, following an initial three short pulses of brightness. Some of us felt that while the overall brightening was real, the pulses might have been an atmospheric effect due to the low altitude of the comet.
2) The Antares occultation by the Moon on night of July 17-18 was greatly anticipated because Chaco appeared to be right on the line for a grazing event; unfortunately, we were clouded out that evening.
3) The central star of M57, the Ring Nebula in Lyra was a target high on my list of priorities. At home, I generally have neither the necessary seeing and transparency conditions, nor the telescope aperture required to visually capture this highly elusive object buried in the filmy heart of the famous planetary nebula. Here at Chaco, two of us finally caught it, in continuous but obvious glimpses, on the second night of trying with the 64-cm telescope at 600×. A major part of the problem, of course, is contrast. While surrounding field stars down to magnitude 15.6 were readily identified, using photometry measurements by Arnie Henden (USNO-Flagstaff), the magnitude 14.8 central star imbedded in nebulosity continued to be difficult but ultimately, not impossible.
4) Never having located Pluto in the past, advantage was taken of the opportunity to definitely identify this remote planet and to track its slow movement across the background stars for 10 evenings, using the 43-cm Dobsonian. Now with the recent discovery of UB 337, a switch to CCD equipment will be needed to follow up on this new 18th-magnitude remote object.
5) Supernova SN 2005cs went off in M51, the Whirlpool Galaxy, in early July. We found the star with the 64-cm reflector rather quickly, using an AAVSO chart to locate it and estimated its brightness as magnitude 14.4 on the evening of July 10-11. Another volunteer imaged the galaxy with the CCD camera on the 36-cm scope. Comparing that image with another taken earlier in the year further confirmed the identity of the supernova.
6) It was a particular pleasure to view some old favorites with large aperture instrumentation under pristine skies. The spiral arms of M51 stood out distinctly, the "twin" galaxies, M81 and M82, glowed brightly and revealed detail not noted in the past and the many Messier objects in Sagittarius and Scorpius showed up better than ever. It was also noted that, for certain nebulae, such as the Veil in Cygnus, light-pollution filters significantly enhanced the view, even under the very dark skies. These were among the many deep-space delights that were explored on my own and also presented to the public.
7) A couple of evenings were spent just slouched back in a lounge chair in the darkness of the campground, watching for meteors. Sometimes it is meaningful to just sit back, relax, and enjoy!

Overall, this has been a richly rewarding experience. In addition to the astronomy opportunities, ample free time was available to not only tour the ancient ruins but also to enter some areas not open to the public. We hope to return to Chaco next year and extend our stay to two months, as there is still a lot to explore, both in the New Mexico sky and along the sandstone cliffs.

Ray Berg is an active amateur astronomer and a "remote member" of the RASC, attached to the Kingston Centre. A retired metallurgical engineer, he observes from his semi-rural home near Crown Point, Indiana but occasionally forays to distant locations in search of darker skies. His last contribution to JRASC, *"Orion Upside Down" (February 1999), described stargazing adventures in Australia and New Zealand.*

Jenn's Supernova

by Debra Ceravolo, Ottawa Centre (debra@ceravolo.com)

The evening of August 3, 2005 was a busy one in the Ceravolo household with the usual juggling of kids along with packing for an annual camping trip to Starfest early the next morning. Jenn was out most of the day tending to her active social life and upon returning home was greeted by her mother, arms crossed, saying, "Don't you have supernova hunting to do?" Isn't that what most mothers say to their daughters? Well that's the case in this house. Supernova hunting is a family affair as Jenn, my husband, Peter, and I are all members of the Puckett Observatory Supernova Search, an international team of volunteers led by Tim Puckett of Georgia - volunteers who scan around a thousand images of galaxies every clear night looking for stars that blow up.

As Jenn downloaded her assigned set of images of old and new galaxies onto her laptop, I could hear loud grumbling coming from her room. "It's not working, this computer is being difficult," she said in so many words...

I offered my laptop on the kitchen table to get the job done. It's important to complete the work and submit a report before midnight so a reshoot can be taken right away if there is a supernova candidate. As Peter and I were compiling a mountain of camping gear and food, Jenn got down to work. After a short time, I became aware that Jenn was staring straight at me, eyes wide, not saying a word.

This was one of those moments that for unknown reasons, the hair on the back of one's neck stands up. I climbed over the mountain and peeked at the two computer images of a galaxy with an extra "spot" on the new image. "That looks nice," I said calmly. One does not get excited about a supernova candidate until one does one's homework. It could be a minor planet, or a hot pixel, or cosmic ray hit on the CCD chip, or a previously

A multi-tasking and obviously pleased Jennifer Tigner examines the image from the POSS survey showing the new supernova discovery.

discovered supernova. These things must all be double-checked before reporting to Tim Puckett. Jenn immediately checked the POSS (Palomar Observatory Sky Survey) to see if the "spot" was there in the old image of the same galaxy. Negative, that's good, now onto minor planets. "It's probably an asteroid," Jenn said with resolve. "They usually are." A quick check on the Minor Planet Web site and negative, no pesky asteroids in the area, woohoo! This is where the heart starts beating a little faster. Check the recent supernova page. No new supernovae reported in galaxy UGC 11097.

At that point Peter handed the phone to Jenn. If there is a good candidate, there's no time to waste. The world of supernova hunting is extremely competitive and there could be another team imaging that galaxy at the same time...and, in fact, there was.

As Jenn spoke to Tim on the phone, she sent off the coordinates of the supernova candidate by email (all this while watching Lion King on a mini DVD player beside her). "Looks good so far," said Tim in his southern drawl, "I'm on it." Tim went back to the scopes and did a reshoot. Fifteen excruciatingly long minutes later the phone rang. The mile-wide smile on Jenn's face conveyed the verdict. It was a new supernova and Jenn and Tim get credit. As we watched it all unfold, Peter took photographs of the event. Jenn, at eighteen, could very well be the youngest person ever to discover a supernova!

It turned out that the Lick Observatory Supernova Search team (a professional team from the University of California Berkeley) was also onto the same supernova that night. Because of the closeness of the two team's reports, it's a co-discovery. If Jenn had waited longer to scan or had not called Tim right away, the Berkeley team would have taken all the credit and Jenn wouldn't have bagged her first supernova and the team's 101st discovery. But everything worked

Discovery photograph of the supernova 2005de in galaxy UGC 11097. The supernova lies between the two white lines. Photo courtesy D. Ceravolo.

out great. The International Astronomical Union sent out the circular confirming the discovery. Later, the Keck II 10-m telescope in Hawaii obtained a spectrum and determined the supernova to be a type Ia, the best kind for measuring distances in space. The supernova was also getting brighter as was Jenn's future.

Jennifer Tigner continues to look for supernovae while attending the University of Victoria studying physics and astronomy, what she always wanted to do. We miss you Jenn, but are also very proud of you. I always knew you were destined for the stars. Congratulations!

Debra Ceravolo is the President of the RASC Ottawa Centre, has discovered one supernova with the Puckett Supernova Search Team. and is still hunting.

Electronic Telegram No. 191
Central Bureau for Astronomical Telegrams
INTERNATIONAL ASTRONOMICAL UNION
M.S. 18, Smithsonian Astrophysical Observatory, Cambridge, MA 02138, U.S.A.

SUPERNOVAE 2005dd AND 2005de
Further to IAUC 8570, E. Lee, N. J. Ponticello, and R. J. Foley report the LOSS/KAIT discovery of two apparent supernovae on unfiltered KAIT images, as tabulated below. SN 2005de was independently discovered by ***T. Puckett and J. Tigner*** *at mag 18.0 on an unfiltered CCD frame taken with the 0.60-m automated supernova patrol telescope (cf. IAUC 8569) on Aug. 3.13 UT.*

SN 2005 UT R.A. (2000.0) Decl. Mag. Offset
2005dd Aug. 1.46 2 34 36.57 +01 20 53.2 18.6 10".7 E, 1".6 N
2005de Aug. 2.28 18 02 23.36 +26 03 07.7 18.1 17".3 W, 33".1 N

Puckett provides position end figures 23s.37, 07".9 for SN 2005de.
Additional approximate unfiltered magnitudes from the discoverers:
SN 2005dd in UGC 2062, 2004 Jan. 16 UT, [19.0; 2005 Aug. 3.50, 18.8.
SN 2005de in UGC 11097, 2002 Aug. 12, [20.0 (Puckett); 2004 Oct. 5, [20.0 (Puckett); 2005 July 28.29, [19.0 (KAIT); Aug. 3.26, 17.6 (KAIT); 4.13, 17.3 (Puckett).

NOTE: These 'Central Bureau Electronic Telegrams' are sometimes superseded by text appearing later in the formal IAU Circulars.

2005 August 4 (CBET 191) Daniel W. E. Green

Counterparts of short gamma-ray bursts finally identified

by Leslie J Sage (l.sage@naturedc.com)

In June of 1997 I wrote in my column about the identification of the optical counterpart to a gamma-ray burst (JRASC 91, p.110). Over the intervening years it became clear that while we can see x-ray and optical (and occasionally radio) counterparts to the "long" bursts, no counterpart had ever been seen to a "short" burst. This situation has now changed, as reported by four groups in the October 6, 2005 issue of *Nature*.

Gamma-ray bursts, known colloquially to astronomers as GRBs, have been known for some time to come in two different flavours, characterized by the length of time the burst lasts, and the "hardness" of the burst, where hardness refers to the energy of the photons at the peak of the energy output. The long bursts last from ~2 to 1000 seconds and the photons are of lower energy than in the short ones, which last <2 s. It was demonstrated back in 2003 that the long bursts are associated with a special kind of rare supernova, which now is thought to occur when a particularly massive star explodes. These bursts tend to lie at cosmological distances. There was one burst associated with a peculiar and relatively nearby supernova, 1998bw, but that connection was not given much credence until GRB 030329 was conclusively shown to be a supernova.

While great progress had been made on understanding the long bursts, the short bursts remained wrapped in mystery. About a year ago, a satellite called *Swift* - the brainchild of Neil Gehrels of NASA's Goddard Space Flight Center - was launched with the express purpose of finding the counterparts to the short bursts. It was designed to localize the gamma-ray emission from the burst, and then rapidly swivel to point an x-ray and optical/ultraviolet telescope in the direction of the gamma-ray source. The first short burst it caught, 050509b (the second GRB on May 5, 2005), did not have a counterpart at optical or radio wavelengths. The x-ray localization was in the outskirts of an elliptical galaxy at a redshift of z = 0.225, but the uncertainty in the position meant that it could have come from a number of background galaxies at even higher redshift. At that point, it appeared that this would be about the best that could be done - there was a feeling that perhaps the short bursts did not have optical counterparts, and therefore the position would never be localized sufficiently to say with any certainty where the burst originated.

Then, on my birthday, GRB 050709 was caught by a different satellite - *HETE,* which is George Ricker's (of MIT). This time, Jens Hjorth of the Niels Bohr Institute in Copenhagen and his team caught the fading optical counterpart. Curiously, this source was located in a star-forming dwarf galaxy, which is where the long bursts usually happen. Also seen was a long burst of soft gamma rays after the initial spike, so at the time people actually debated whether this was really a short-hard burst, or whether it was a long-soft one. Ultimately, it was demonstrated that the soft gamma rays would not have been seen by the (now gone) BATSE experiment on the Compton Gamma-ray Observatory, and therefore the burst would have been described as a short-hard one. But there was a lot of back and forth about this, and the fact that it was in the kind of galaxy normally associated with the long bursts added to the confusion. This caused people to question whether GRB 050509b actually was in an elliptical galaxy.

The situation became much clearer (at least to me) when GRB 050724 was caught by *Swift*. This one had an optical counterpart too, and it was located in the outer regions of an elliptical galaxy. That observation made the association of GRB 050509b with an elliptical seem much more likely.

In the meantime, a group associated with Shri Kulkarni at Caltech was getting observations of GRB 050709 using the Hubble Space Telescope, the Very Large Array in New Mexico, the Chandra x-ray observatory, and various ground-based optical telescopes. They were able to get a spectrum of the host galaxy, and determined it to be at a redshift of z = 0.16. Moreover, they could demonstrate conclusively that the burst had no supernova-like signature - not even the faintest known supernova could have escaped them. Based on this, they were able to determine that the energy in the burst is about a factor of 1000 less than in a typical long burst, pointing clearly to an origin very different than a supernova.

What makes these short-hard bursts? Before 2003, one of the more popular explanations for the long bursts was a merger of two neutron stars, which immediately collapsed into a black hole. But once the association of the long bursts with a supernova was demonstrated,

lending weight to the collapsing single-star model proposed by Stan Woosley in 1993, theorists quickly shifted gears and put forward the neutron star-neutron star explanation for the short bursts. While that remains the favoured explanation with these new data, I think it is important that people not climb aboard a bandwagon that might be going in the wrong direction.

The evidence in favour of a neutron star-neutron star origin for the short bursts is strictly circumstantial at this point. There are only a limited number of celestial objects capable of producing explosions at the required energies and timescales, and neutron stars are certainly amongst the strongest candidates. A binary system containing two neutron stars could plausibly be in an old elliptical galaxy, without any recent star formation, and also in a galaxy that is actively forming stars. So, the explanation is consistent, but that does not mean it is right! I should point out that another possibility is a neutron star falling into a black hole that it has been orbiting, though such systems ought to be quite rare, and therefore probably could not account for the bulk of the short bursts. Shri Kulkarni was criticized for five years for pushing the supernova association with the long bursts, but he turned out to be right. I'm not placing any bets on the short bursts just yet!

Leslie J. Sage is Senior Editor, Physical Sciences, for Nature Magazine *and a Research Associate in the Astronomy Department at the University of Maryland. He grew up in Burlington, Ontario, where even the bright lights of Toronto did not dim his enthusiasm for astronomy. Currently he studies molecular gas and star formation in galaxies, particularly interacting ones.*

Dr. Paul Chodas

by Philip Mozel, Toronto Centre (philip.mozel@osc.on.ca)

It looked harmless enough - just another small asteroid shaped so exactly like a peanut that the resemblance was almost comical...even now, most of mankind could still not believe that it was the instrument of doom.

So wrote Arthur C. Clarke, about an asteroid named Kali, in the novel *The Hammer of God.* A spacecraft and crew is approaching the giant boulder to divert or destroy it before collision with Earth causes untold disaster. But before remedial action can be taken against any possible threat, an asteroid's course through space must first be determined. In the non-literary world, this job falls to scientists such as Dr. Paul Chodas.

Asteroid designations are generally a tedious combination of numbers and letters. Such designations belie the interesting nature, and importance, of the objects under study. Take 2002 AA29 for example. It is an Earth co-orbital asteroid. This means that it follows a path around the Sun similar, but not identical to, that of Earth (*i.e.* a 1:1 mean-motion resonance). As Dr. Chodas explains,

> The asteroid follows a "horseshoe" orbit, named for the trace of its curious path relative to the Earth. For decades prior to 2003, the asteroid had been slowly approaching our planet from the leading side, but as it got closer, the gravitational interaction caused the relative motion to reverse. The asteroid is now slowly pulling away from us, only to have the same effect happen ninety-five years from now, when it reaches the other end of the horseshoe on the trailing side of the Earth. All the while, the asteroid bobs above and below the ecliptic plane in an annual cycle.

As if all this gyrating isn't enough, 2002 AA29 periodically becomes a quasi-satellite of Earth. It then sits in the gap of the horseshoe making dozens of large loops around our planet, while still remaining in solar orbit. After a few decades, it goes back to its horseshoe path. This rollicking rock was last in a quasi-satellite state in AD 550 and will be so again around the year 2600. No other asteroid is known to make the transition from horseshoe to quasi-satellite and back.

A crude idea of the shape of this planetary horseshoe can be obtained by bending a slinky into a not-quite-complete circle and placing a marble (the Earth) between the two ends. Changing our perspective and looking up from the surface of the asteroid, we would continuously see Earth approach and recede while moving up and down in the sky. Dr. Chodas and his colleagues were the first to point out the co-orbital nature of this particular object.

Perhaps the most familiar example of co-orbiting asteroids is the Trojans that share Jupiter's orbit, sixty degrees ahead of and behind the giant planet. Since our own co-orbital object approaches Earth so closely, it is a natural target for space missions. Such a mission might resemble the Near Earth Asteroid Rendezvous (NEAR) probe's flight to Eros or Hayabusa's to the asteroid Itokawa.

Dr. Paul Chodas

Asked if he would like to travel to an asteroid in person, Dr. Chodas laughs, "Yes, but only if the flight can be drastically reduced from the years-long times currently required." Nevertheless, he did nearly get a chance to fly in space, being among the final 64 contenders during Canada's first astronaut selection process in 1984.

Due to the orbital calculations by Dr. Chodas and his colleagues, naked-eye sky watchers are now aware of the

observing opportunities in the year 2029 when asteroid 2004 MN4 buzzes Earth. On April 13 this 320-metre-wide rock, then shining at 3rd magnitude, will zip overhead at the rate of 42 degrees per hour! This speedy passage is due to a miss distance of only 30,000 kilometres which is "...simply astonishingly close for such a large asteroid!" according to Dr. Chodas.

As well as recently discovered objects, Dr. Chodas has studied mysterious asteroids from the past - Hermes, for example. In 1937 this near-Earth asteroid was discovered . . . and almost immediately lost. As Dr. Chodas explains,

> When an object in a somewhat similar orbit was spotted in 2003, many astronomers suspected the object to be Hermes, but the orbits were too dissimilar to be sure. By calculating the precise series of Earth close encounters, which modified the 1937 orbit into that seen in 2003, Jet Propulsion Laboratory (JPL) colleague Dr. Steve Chesley and I were able to prove that the new object was in fact the long-lost Hermes.

This potentially hazardous asteroid is worth keeping an eye on and, thanks to Dr. Chodas's work, it is unlikely to be misplaced again.

Dr. Chodas has also been active among the not-so-near Earth objects. With Dr. Don Yeomans, he determined the precise orbit of Comet Halley for the International Halley Watch. He also worked on determining the positions of the main-belt asteroids Gaspra and Ida so that the Galileo spacecraft could slip up on them while en route to Jupiter.

When Louis Pasteur said "Chance favors the prepared mind," he might as well have been thinking of Dr. Chodas's involvement with Comet Shoemaker-Levy 9. When Brian Marsden, of the Smithsonian Astrophysical Observatory, asked him to check calculations indicating that an impact would occur with Jupiter, Dr. Chodas was indeed well prepared. He had, just the week before, presented a paper on calculating impact probabilities! Crunching the numbers, some based on excellent Japanese amateur observations, he immediately determined that there was a sixty percent chance of impact. This quickly rose to one-hundred percent and, before long, Dr. Chodas began predicting the impact times and locations as well.

"The timing was amazing," he says, as the work had been purely theoretical until the impacts took place. "It was a very exciting project to work on."

One appealing sidelight of such experiences for Dr. Chodas is the beauty of the math that allows us to track objects in space and then predict times and locations of their impacts on distant worlds. "Actually seeing the huge scars of those collisions on Jupiter was just incredible."

This interest in celestial wanderings is of long standing. His attention was riveted by Sputnik as well as the early communications satellite Echo that his parents pointed out as it passed through the night sky. He admired the Jet Propulsion Laboratory from an early age and was riveted as that institution's Mariner 2 flew by Mercury in 1962. Frequently writing letters to the lab, he asked for the latest information and copies of pictures from the centre's interplanetary probes. By the age of ten, he was a member of the RASC.

Science fiction played its role too as, while reading about human flight to Mars, he wondered, "Just how *does* one calculate the flight path to another planet?" (And yes, he has read novels about interlopers in near-Earth space such as *Rendezvous With Rama* and *The Hammer of God*). And while not quite Rama-like, the motion of what was probably the Apollo 12 third-stage rocket was calculated by Dr. Chodas in 2002, thereby pinning down its probable identity. His team was able to show that this "UFO" was temporarily captured from solar orbit by Earth before leaving us once again for an independent orbit around the Sun.

After earning a degree in mathematics from the University of Waterloo, Dr. Chodas went on to a Ph.D. in aerospace engineering from the University of Toronto. His graduate work was coveted by the very same JPL he admired as a youngster and he now finds himself a Research Scientist at the lab. He is quite "happy to apply my skills to something as useful as Earth impacts." Appropriately enough, asteroid 5553 Chodas was named in his honour.

Such work is but the tip of the...well, asteroid as far as Dr. Chodas's career is concerned. But important work it is because, somewhere out there, Kali is waiting.

Philip Mozel is past-National Librarian of the Society and was the Producer/Educator of the McLaughlin Planetarium. He is currently an Educator at the Ontario Science Centre.

WEB ACCESS TO FEBRUARY 2006 ISSUE

Mars: Early Observations in 2005

By Harry Pulley, Hamilton Centre (hpulley@rogers.com)

Along with Mercury, hiding in the glare of the Sun with its diffuse markings, Mars provides the only view of a planetary surface that can be seen with an amateur astronomer's telescope. And, unlike the Moon's unchanging surface, Mars' surface features are not static: "The albedo features undergo not only a rather predictable pattern of seasonal changes, but also long-term or "secular" changes in size, outline and intensity" (Dobbins, Parker & Capen 1992, p. 67). The planet's atmosphere also shows changeable weather patterns, so Mars is unique in offering dynamic features for observation in both its sky and its landforms.

Conventional wisdom specifies that observations should wait until Mars rises above an altitude of 35 to 45 degrees, a limit that would have made the entire 2003 apparition a write-off for Canadian observers. In comparison, the 2005 apparition comes with a more favourable geometry: a high declination that makes for a generous culmination as it approaches opposition. The early view of Mars this year was much steadier than in both 2003 and 2001 when the planet had a more southerly declination. Even though the planet was closer to the Earth in 2003, its lower altitude reduced the effective resolution (Figure 1).

Though CCD, video, digital, and web cameras have become the most popular method of imaging the planets, many amateur astronomers continue to practice the art of sketching. At one time, visual observation offered promise of more detail than photographs, but video cameras and webcams have revolutionized imaging by allowing hundreds or thousands of images to be captured and combined into a spectacular single image rather than hoping for a good shot or two from a roll of thirty-six exposures. Nonetheless, sketching is still valuable because the setup and image capture time is much quicker than the "store now and process later" technique of many video and webcam imagers. This advantage sometimes allows the paper-and-pencil astronomer to alert the video astronomer to interesting changes on the planet in time to capture them on electronic media. In addition, the nearly four hundred years of hand-drawn observations of Mars since the invention of the telescope can be compared to today's sketches, linking modern images to those of the past.

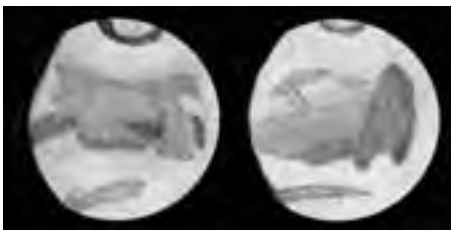

Figure 1 – A pair of sketches showing the effects of good and poor seeing. Notice how the left sketch is more detailed than the right; the left agrees more with accepted Mars maps. Seeing was 9/10 in left sketch but only 5/10 in the right sketch. Both drawings were made by the author using an 80–mm f/9 achromatic refractor at 180× with #21 orange and other filters. Central meridians were very close, 26 degrees in the left sketch, 23 degrees in the right sketch. The left sketch was done September 18, 2005, at 9:50-10:07 UT, the right sketch on September 20, 2005, 10:45-11:05 UT.

Whatever methods of imaging are used, Mars' features must be captured quickly. The planet rotates nearly as fast as the Earth; this rotation, at around fifteen degrees an hour, moves features across the disk in a short time. If a sketch is not completed quickly, then the relative positions of features will not be correct. For a similar reason, a series of electronic images that takes too long to capture can result in a slightly blurred photo. Figure 2, a pair of sketches made less than two hours apart, shows the magnitude of Mars' quick rotation.

Figure 2 – Two sketches made less than two hours apart, showing the rotation of Mars. The images were sketched on September 24, 2005 at 317× with an apodizing mask, using a 317-mm f/5 Dobsonian. The top image was done at 9:15 UT and the bottom at 7:30 UT by Bill Weir of Victoria Centre.

Though the Hubble Space Telescope (HST) and spacecraft orbiting around Mars offer unequalled views of the planet's surface and weather, they have limitations in their ability to monitor the planet. Observations from Earth can be performed much more often than the time allotted on the HST and can provide a wider field of view and a different viewing angle than satellites in Mars orbit. In recent years, members of the Mars section of the Association of Lunar and Planetary Observers (ALPO) were able to contribute to a climatology of Martian weather patterns by using visual and electronic observations collected by amateur astronomers across the globe.

Surface Features

While the prominent surface features of Mars are easily recognized, experienced observers will find some noteworthy differences in smaller features when compared to records from past oppositions.

Some light features will be absent, filled in, or dulled, while dark areas may appear larger or attached to neighbouring regions. Though these changes may be somewhat uncertain at first, they become more visible around the date of opposition when Mars appears largest, assuming, of course, that there are no dust storms to hide the surface view.

Syrtis Major is the most prominent feature to be seen in a small telescope. In the past it has been very dark and prominent, with its "hook spur" quite visible in good seeing. This year I note that Syrtis Major appears more pointed rather than the usual blunted shape it has had in apparitions since the 1980s, though it does not seem as pointy as it appeared in the 1950s (Dobbins, Parker & Capen, *ibid.*, p.68). Syrtis Minor has also been quite visible, along with Sabaeus Sinus, though the latter seems to have modified its appearance, judging by observations made during past oppositions.

I have also observed that Sinus Sabaeus seems to be fatter than indicated on traditional Mars maps. This has also been noted by Denis Fell of Canadian Marswatch 2005, who comments that

> Mars is notorious for large-scale changes to albedo markings from one opposition to the next. For example, in 2003 Sabaeus Sinus was clear and well defined, but this year Deucalionius Regio is much darker giving the impression of a big fat band running south of Sabaeus Sinus, across its entire length. In 2003 Solis Lacus was quite dark and this year is much lighter.

The head end of Sabaeus is not very obvious because of this widening. The feature sometimes appears almost as large as Syrtis Major when the latter is made smaller on the limb due to foreshortening. In spite of this, the division from Decaulionis Regio is still obvious enough to make an identification of Sabaeus Sinus.

Bright areas Zephria, Argyre, and Eridania seem to have been relatively invisible in the first half of this year's apparition, even though the southern polar cap is small. They have appeared darker than normal, blending into their surroundings when they are usually light features that stand out. Chryse has been bright, however.

Mare Cimmerium and Tritonis Sinus appear to be vaguely attached to Mare Tyrrhenum via an area of darker-than-normal material instead of being clearly separated by the lighter Hesperia region.

Martian Weather

At the start of the approach to opposition, the south polar cap appeared large and bright. Since then the cap has shrunk considerably and become less bright with Mars's summer approaching. Figure 3 illustrates the dramatic shrinkage in the caps in a period of just over two months.

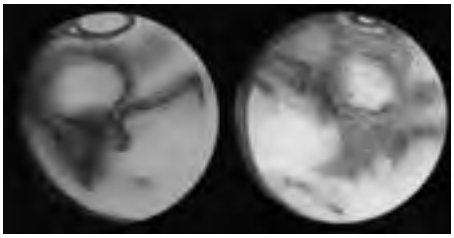

Figure 3 – Two images showing the shrinking of the southern polar cap. The left sketch was made on July 14, 2005 at 9:00 UT and the right on September 22, 2005 at 5:30 UT. Both images are by Denis Fell of Edmonton, Alberta using a 6" achromatic refractor with #21 orange and other filters at a magnification of 200× and higher.

Early in the apparition, the north polar hood appeared its usual light blue, but recently it has appeared less blue to me. I seem to be in a minority here, as other observers have been arguing about whether it is in fact bluer than normal. Dark areas have also appeared in the north, and several other observers, using electronic and visual methods, have confirmed them. The dark areas do not agree with generally accepted Mars maps such as that in the *Observer's Handbook;* the changes are suspected of being atmospheric in nature. This will be an interesting phenomenon to follow as Mars approaches and passes opposition.

Along with changes in the polar caps, Mars's atmosphere appeared clearer

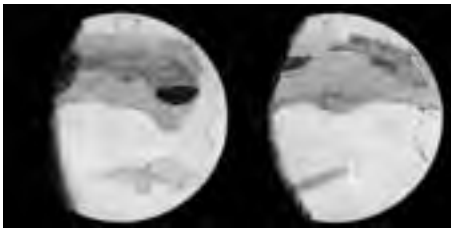

Figure 4: Two images showing the results of using different filters. Both images were made on September 5, 2005 at 7:30 UT using a 200-mm f/9 catadioptric at 225× with seeing at 3/10. The left image was made with a #21 orange filter, the right image a #80A blue filter. Both were made by the author from the Hamilton Centre's Leslie V. Powis Observatory in Flamborough, Ontario. These sketches were done before Mars's atmosphere seemed to clear in blue light.

in late September and early October than it had in the two months previous. Through blue filters, Mars's surface features were invisible in August and early September, but by late September dark surface markings were readily detectable in blue light and were almost as visible as when seen through a red filter. This clearing is somewhat controversial, as some observers report that the appearance in blue light is entirely normal, while others agree with my observation. Figure 4 shows the normal appearance of the planet in blue (and orange) light; Figure 5 demonstrates the

Figure 5: A sketch showing the surface detail visible in blue light at the end of September, done by the author on September 30, 2005, at 8:14-8:23 UT using a 200-mm f/9 telescope at 180× and a #80A blue filter. Note Syrtis Major and Minor, Tritonis, Sinus, Mare Tyrrhenum, and Mare Australe.

effects of the blue clearing, in that some surface features that are not usually visible now can be seen. If confirmed, the clearing

may indicate that upper-level clouds, ice crystals, and moisture are mostly absent, though there are several hypotheses that attempt to explain the phenomenon. According to Price (1994, p.143) "None of the theories are entirely satisfactory..." Whatever the case, the "clearing" may last for a short period or linger over a longer time and will be followed assiduously over the second half of the opposition.

Price (*ibid.* p.172) suggests that we "...look for the appearance of clouds, fogs, and mists" once the polar caps melt. While I have noted small blue clouds on Lapygia Viridis (Figure 6) there have not been many others except for the north polar hood and some limb arcs. As of early October I had seen only one image featuring a W-shaped orographic cloud. My observations recorded blue limb arcs and limb clouds around the middle of September, a report that was confirmed by others and that seems to show a seasonal increase in cloud activity. In early September, I saw some green limb arcs in blue light, indicating the presence of ground fogs. Nevertheless, in spite of the degree of sublimation apparent in the southern cap, I have seen few clouds.

No major dust storm had been seen up by early October. Some yellow clouds over Hellas and Libya appeared darker to me in red light than they normally

Figure 6: A sketch showing a small blue cloud, slightly above the centre of the sketch, done by the author September 21st from 5:00-5:40 UT, at 144-180× in an 80-mm f/9 achromat, seen best with a #80A blue filter.

have, but I have had some disagreement with others on this point. Yellow clouds are generally considered to be dust clouds blown up by winds on Mars and "...the harbingers of great dust storms..." (Dobbins, Parker & Capen, *op cit.*, p. 69). While these disturbances are interesting, most observers hope there will not be a major dust storm, as it will block out the surface features.

Conclusion

Sketching remains a rewarding and individual way to see Mars, even in competition with modern cameras and space probes. The high northern declination of the current opposition has provided observers in Canada with a steadier view and a marvelous opportunity when compared to recent past apparitions of the Red Planet. The changes in surface features and developing cloud patterns noted above await further observations by Canadian astronomers.

Please send sketches and reports about Mars, other planets, and the Sun to the author for possible inclusion in future JRASC articles.

Marswatch can be found at: `www.spacealberta.com/mars/mars2005/others/marswatch2005.htm`

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Confessions of an Astronomer - The Morning Julia Winked at Me!

By Richard Huziak, Saskatoon Centre, (huziak@sedsystems.ca)

Another email appeared in my inbox on August 8 announcing that the 10.4-magnitude asteroid (89) Julia was going to occult 1 Trianguli, a 7.6 - magnitude star. I didn't pay much attention to this message at first as I had chased dozens of asteroid occultations unsuccessfully over the last 25 years, and from the motivational point of view, another failed attempt was not that appetizing.

However, this event had a bit of an appeal to it. First, it was predicted to occur both over my house and over the Sleaford Observatory, 60 kilometres to the east of Saskatoon. The prediction seemed pretty reliable, and the further east I travelled, the higher the probability that this would be a positive event. Besides, we were having a very nice August with a lot of clear nights, so clouds wouldn't likely be an issue. On the downside, the occultation was to occur just past 3 a.m. local time on a work night.

The mechanics of an asteroid occultation are simple. As an asteroid moves along in its orbit it has the chance to *occult*, or cover up, the occasional star in the sky. Since the star is basically at infinity and acts as a point source, the asteroid will cast its shadow onto the Earth as it passes in front of the star. The shadow is exactly the shape and size of the asteroid. It sweeps out a path over the Earth in the same fashion as the Moon's shadow during a total solar eclipse. And like a total solar eclipse, the event can been seen only along a unique path. If you are lucky enough to be on the path, or motivated enough to travel to it, then you may see the asteroid wink out the light of the star for a few seconds. Using the simple formula d=vt, where "v" is the orbital velocity of the asteroid and "t" is the time you saw the star wink out, you can solve for "d," the diameter of the asteroid. Well, it's not quite that simple. The calculations are a bit more involved since the Earth and the asteroid are both moving and you can only solve "d" for motion in the direction of the shadow's movement. But if you catch the wink, then you can get some data about one of the dimensions.

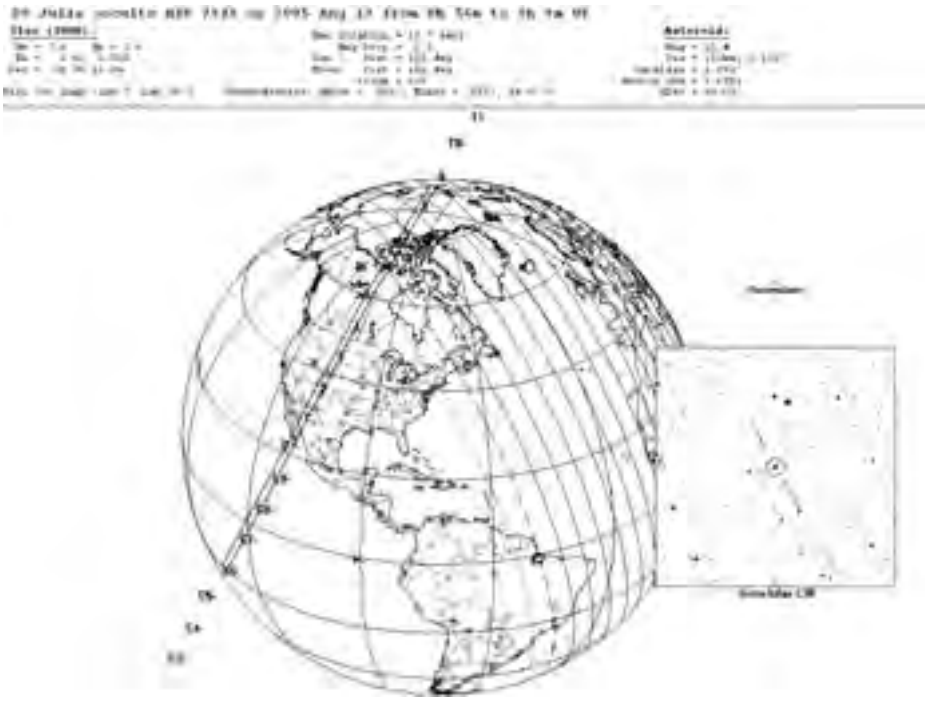

Figure 1 – Mark Preston maintains an excellent Web site that gives asteroid predictions, track maps, and finder star charts. This figure of the (89) Julia occultation track is from his site, produced using *Occult* software by Dave Herald. Future occultations have these maps prepared well in advance. Figure used with permission courtesy Mark Preston.

To measure the width of the asteroid across the shadow, the same technique is used, but multiple observers are needed, spread out perpendicular to the direction of movement. The more observers across this shadow, the better the chance that a representative shape can be calculated, assuming that everyone makes a successful observation. For example, if the asteroid were a hundred kilometres across, the most productive method would be to place an observer every few kilometres across the path so that each one sees his own unique chord of the track. In this way, plotting an assembly of the chords would then reveal the asteroid's size and shape.

This is all fine in theory, but life is not that simple.

The asteroid's diameter is generally not well known if it has never been measured before. Instead the size is assumed from measurements of its albedo,

or the amount of sunlight reflected from its surfaces. Since we do know a lot about exact surface compositions, and even the biggest telescopes can resolve only the largest and closest asteroids, the dimension and shape of a typical asteroid are uncertain by a fair amount. (89) Julia was assumed to be 151 km in diameter using the best estimate of the day. Throw in the uncertainty in size with the error in the catalogue position of the background star it will occult, and all of a sudden the exact path of the shadow on the Earth becomes pretty fuzzy, often by dozens of kilometres. To further mess things up, getting a few dozen friends to stand 5 kilometres apart in the dark at 3 a.m. on a workday just won't happen.

Luckily, a solution comes in the form of the International Occultation Timing Association (IOTA) and their fearless leader, David Dunham. Dunham issues asteroid occultation announcements several days before each event, and with them comes a plea for observers to monitor the shadowing of the background star. Dunham also makes specific predictions for each observer who will be on or near the path and provides information about alternative track possibilities, using a number of occultation prediction resources. Where possible, IOTA requests up-to-the-minute astrometry from cooperative observatories to refine the orbit of the asteroid and position of the star as the event approaches. With these in hand, Dunham provides track and timing updates right up to the day of the occultation. To get on IOTA's emailing list, you simply have to volunteer to try to observe an event. Prediction maps and star charts are also available from several other occultation hunters.

A targeted campaign with observers distributed across the path is easiest if, in each centre, someone is motivated enough to organize the club well in advance of the event, as the Edmonton Centre has done successfully on a few occasions. But it isn't necessary that all observers be in one place; IOTA is willing to settle for observations from different geographic locations. Though all observers see the occultation at different times as the shadow sweeps across their respective locations, the results can be normalized to a common baseline and the asteroid profile recreated.

So, to get back to my motivation: Dunham's predictions and tempting updates got me thinking that this was going to be the *one* - the one that broke my perfect streak of a few dozen negative observations where I had stood out in some cold, damp field somewhere in desolate Saskatchewan and saw exactly squat for my effort. (Well, not exactly squat - I'll explain later.) The errors for Julia's track were small, and the Sleaford Observatory had a very high chance of seeing the shadow.

I couldn't stop thinking about two past tries, though. On one of my first attempts many years ago, a beautifully clear sky awaited as I set up for an almost certain occultation of an asteroid whose name is now lost in my ageing mind. As the time drew near, a single cloud about 10 degrees in diameter appeared at the horizon, moving directly toward me. "What are the odds it will arrive in time to cover the field and spoil my observation?" I mused. The cloud was true to the challenge, covering the field of view just a minute before the occultation and leaving the field a few minutes afterward, passing away in the distance to reveal again a perfect sky, and one very disappointed astronomer.

In November 2004, the (752) Sulamitis occultation was scheduled to occur over the Sleaford Observatory in the early morning. Predictions were good all around. But despite very good coverage across North America, the asteroid seems to have found the smallest gap in the coverage, and no one anywhere, including me, saw even the slightest wink.

Undaunted by past failures, I gathered up my equipment the night before. I was going to do this anyway! You don't need a lot of equipment - a telescope, a shortwave radio that can pick up the WWV time broadcast, and an audio tape recorder. I made sure that the batteries were fresh, that the WWV radio worked, and that the tape recorder recorded. After a few hours of sleep, I awoke at 1:30 a.m. on August 13 and drove the 45 minutes to Sleaford. I got set up, found the WWV time signal, and located 1 Trianguli in the clear, dark sky. I was completely ready a full half-hour before the scheduled time. Things were perfect! This would finally be *the one*.

Well, maybe not. Only four minutes before the event, my WWV radio, which previously had a clear and strong signal, simply quit! It just stopped working and gave a constant buzz. I couldn't recover the WWV signal no matter what I tried. When I loaded the car earlier, I had not noticed that Murphy had hitched a ride. I fumbled with the recorder until the last minute before the scheduled disappearance time, and then I decided I had better get to the scope to time, I hoped, at least the interval between disappearance and reappearance.

At just about the predicted time, 3:04 a.m. CST, the star abruptly winked out, fading by 2.8 magnitudes—a very obvious change. I shouted into the tape recorder to record the disappearance time. Now I was seeing just the sunlit face of the asteroid! I waited; as I anticipated the reappearance of the star, and just over half a dozen seconds later, the star winked back! *I had done it.* I had observed my first asteroid occultation!

But now I had the problem of figuring out a way to get the exact time of the event. A bit disappointed but still determined, I decided to read off the seconds from my watch into the time recorder beginning a minute or so after the occultation. I did not have an alternate source for WWV at the observatory, so I packed up my equipment and drove back

Asteroid Occultation and Prediction Web Sites

The International Occultation Timing Association (IOTA):
www.lunar-occultations.com/iota/iotandx.htm

Steve Preston's Occultation Prediction Site:
www.asteroidoccultation.com

It's in your 2006 *Observer's Handbook,* too!
See pages 213-216.

to Saskatoon. Checking my watch against USNO Time on the Internet at 4:22 a.m., I found it to be exactly 2.5 seconds fast. I used this correction to reduce the times on the tape.

But despite a heavy chastising at Sleaford, Murphy hitched a ride back to town and worked some more unwanted black magic. My wristwatch is automatically and periodically reset by GPS, and I could not guarantee that, in the interval between the observation and the USNO time correction, GPS had not reset the watch.[1] If it had not, total errors in the timings would have been less than 0.5 second, but in my mind I did feel that the occultation seemed to have occurred a few seconds sooner than the prediction. There wasn't much I could do about it now. With the corrections computed, I emailed a report to David Dunham and excitedly reported my first-ever successful timing, even if Murphy had been along to foul things up. I provided my latitude, longitude, height above sea level, and all the timings I had done: disappearance time, occultation interval, and reappearance time. At the Sleaford Observatory, the asteroid winked out the star for 8.152 ± 0.003 seconds, and the event occurred, tentatively, between 09h 03m 39.36s and 09h 03m 47.51s UT, 13 August 2005, +/- 0.50 seconds, pending my watch time being found to be correct.

A few days later, Dunham emailed back and reported that 6 other observers had successfully observed this occultation, one being Paul Maley, an American who had flown up to Saskatchewan to find clear weather! That's pretty dedicated! So with the seven chords, Dunham reconstructed the shape of the (89) Julia (Figure 2).

The asteroid turned out to be oval, with major and minor axes of 174.4 +/- 5.9 km × 135.6 +/- 2.6 km — a pretty good fit to the 151-km prediction! The ovoid

Figure 2: The shape of (89) Julia from the preliminary reconstruction by David Dunham (IOTA) using chords from seven observers. The observers and their viewing locations are as follows: 1: James Thompson, Eagle, CO, 3: Mark Vincent, W., Socorro, NM, 4: Trina Ruhland, Miners View, CO, 5: Roc Fleishman, La Paz, BCS, Mexico, 6: Richard Keen, Mt. Thorodin, CO, 7: Richard Huziak, Sleaford Obs., SK, 8: Paul Maley, Pense, SK. Chord 2 is a non-corroborated observation by Mark Vincent that, if verified by another observer, could have indicated the presence of a satellite asteroid. It more likely has an earthly cause. Figure used with permission courtesy David Dunham.

curve actually fits the measured shape surprisingly well, indicating that our collective observations really were quite well done. My observation turned out to be the westernmost chord, catching a slice about one-half way to the centre from the west edge. In hindsight, if I had stayed at home in Saskatoon, I would have caught the occultation very near the edge, extending the coverage even farther.

Murphy seems to have got around. Mark Vincent recorded a quick blip a few seconds beforehand (chord 2), which was not corroborated by a second observation, so must be treated with suspicion. Mark Vincent's (chord 3) and Trina Ruhland's (chord 4) paths were too short and too long respectively to fit a smooth outline profile, but these observations may be refined by reanalysis of their data. These are not unexpected errors, and generally most occultation observations are less than perfect for a variety of reasons. Small discrepancies like this point out why more observers are always needed.

My data were not unscathed either. Dunham had to add 5.5 seconds in order to get my timing in step with everyone else, though my observation (chord 7) fits very well once adjusted. My GPS watch had indeed updated before I could confirm

What You Need to Observe Asteroid Occultations

These days, more observers are using higher-tech equipment, but not that high-tech. A good ready-to-go system for observing occultations is affordable for most observers.

Minimum:

Telescope
Stopwatch
WWV signal (shortwave radio)
Your latitude, longitude, and height above sea level
Transportation to the event
Lots of luck

Desired:

Telescope
Audio tape recorder
WWV signal (shortwave radio)
Your latitude, longitude, and height above sea level
Transportation to the event
Lots of luck

Best:

Telescope
Low-light video camera
VCR or digital recorder
GPS receiver to get latitude, longitude, and height above sea level
An event that comes to you
Everything working when you need it

[1] GPS Watch Warning-After my brother gave me a NexxTech GPS time-correcting watch for Christmas, I had assumed that I would never have to worry about exact times again. But with a bit of experience, I quickly realized that the manufacturer of the watch seemed to assume that since the GPS signal would periodically update the time, the watch itself did not have to be that accurate. I now find that the watch can be many seconds off true time within an hour of the last GPS update! When solar activity is high, the GPS signal may be blocked, and it may be days before the watch updates, at which time it may be out several minutes. Before the GPS watch, my older Timex was always wrong, but because it lost or gained time linearly and predictably, I could always check the latest offset to WWV time and know the correction accurately for a few days.

my times.

Vincent's suspicious observation still illustrates the power and value of negative observations. My past failures were not failures as such because these unsuccessful chords represent the dark sky in the immediate vicinity of the asteroid. Should there be a small satellite asteroid present, observers may detect it with smaller secondary winks. You should always begin observations a few minutes early and end them a few minutes after the main occultation to rule out, or better yet, catch the presence of any asteroid moons.

Future observations may have better planning on my part. The list of equipment required for a reliable observing run is quite short and very affordable. I made this observation with a tape recorder, a watch, and my telescope (and a busted shortwave radio). But to get more accurate readings with fewer foul-ups, recording the event on videotape or digitally makes a lot more sense, and most serious occultation observers use this method nowadays. Low-light cameras such as black-and-white security cameras are not expensive. Pair this with a reliable WWV signal recorded simultaneously, and you have a permanent record of the event that can be analyzed frame by frame to produce very accurate measurements. In tests, I found that with a small low-light camera, I could reliably record 9th magnitude stars through my 10-inch scope in real-time video. With new CCD-based video or digital cameras now commonplace, recording of real-time astronomical events is becoming far more frequent and far easier than it used to be.

By missing a little sleep, and with the minimum of equipment and trouble, I managed to do a scientific measurement of the size of an asteroid along with a small, dedicated crew scattered around North America. This is something that every one of the 4900 RASC members is capable of doing. Why not think about how you can turn your next observation into an Observation for Science? Besides, it's just a lot of fun to try!

Richard Huziak is the President of the Saskatoon Centre of the Royal Astronomical Society of Canada and has been an active amateur astronomer since 1968. His main astronomical interests are variable-star CCD and visual photometry, meteor counting, and asteroid occultations. For his work in research and the promotion of astronomy, Richard was awarded the RASC Chant Medal in 2001 and the Director's Award from the AAVSO in 2003. In January 2004, the International Astronomical Union permanently gave the name Huziak to asteroid number 4143.

FROM THE PAST — AU FIL DES ANS

SOME ITEMS IN THE PROGRESS OF ASTRONOMY IN 1931

The past year, the one hundred and fiftieth anniversary of the year in which was made the first great discovery beyond the planet Saturn, has been tense with interest in, and active investigation of, this super universe, which is not only colossal in its extent, but apparently is also expanding at a terrific rate. Hubble, at Mount Wilson Observatory, has photographed the island universes at distances of 140 million light-years. Within this distance he finds that there are about two million nebulae which are fairly uniformly spaced at about 1,800 thousand light-years apart. What an advance this is over the reach of our knowledge when we thought of the Milky Way as the bounds of the universe—the Milky Way with its radius, as we now believe, of between 100 and 150 thousand light-years. Our own Galaxy we now know to consist of a vast aggregation of stars and nebulae in the form of a wheel in which the sun is not at the centre but is approximately 1/3 of the way out along one of the spokes of the wheel and revolving around the hub at about 200 miles per second, taking about 200 million years to make one complete revolution.

by H. R. Kingston
from *Journal,* Vol. 26, p. 97, March 1932

Moonlight Nights

by Bruce McCurdy, Edmonton Centre (bmccurdy@telusplanet.net)

I feel quite sure that I first viewed the moon in my small scope with just as much incredible delight as Galileo did in his. It is true that I had seen photographs of the moon and therefore had some vague idea of what its appearance would be like, but I was wholly unprepared for all the wonders which I found on that first night as I explored the lunar surface. No photograph has yet been made which is not cold and flat and dead when compared with the scenes that meet one's eyes when the moon is viewed through even a small telescope.
– Leslie Peltier (1965), *Starlight Nights*

Photo: Scott Henderson, Edmonton Centre

The Moon is the first astronomical object to grab anybody's eye, and has provided "first light" for countless telescopes between Galileo's time and mine. Many folks soon move on to bigger and further things, even planning observing schedules to avoid moonlight nights. But I still find myself turning and returning to Earth's satellite, always with "incredible delight."

I first felt the Moon's tidal influence in December 1968, as the Apollo 8 astronauts Borman, Lovell, and Anders made the astonishing first leap to the Moon, increasing humankind's reach for the stars by three orders of magnitude in a single bound. It increased my personal outward gaze by a factor of infinity, and for the remainder of my grade-school years I was a big space buff.

It was natural then that when my adult eyes finally returned heavenward shortly after the opening of the Edmonton Space Sciences Centre in the mid-1980s, the Moon would again capture and hold my attention. I observed it by eye, with binoculars, through the telescopes at the Observatory where I now volunteered, through my own first telescope. My approach, however, was haphazard, unstructured.

"I spent many of those early nights in wandering aimlessly about the moon. I followed the advancing sunlight all across her face. I descended into craters by the score - Plato, Eratosthenes, Tycho, across majestic Clavius, and down the blinding wall of Aristarchus. One night I walked across the strange and violent gash of the Alpine Valley and then I climbed a tortuous trail from peak to peak along the sweeping range of the Apennines. I rested briefly in the long black shadows of Pico and Piton, whose towering monuments rise starkly from the level surface of the Sea of Showers."

One glorious evening that all changed. On March 8, 1993 the Moon experienced an exceptionally close perigee, one that will not be exceeded until 2016. For some reason this captured my interest on both a theoretical and observational level. I did a fair bit of advance research, some simulations on *Dance of the Planets*, and undertook my first brief correspondence with Jean Meeus about some of my findings.

The huge Full Moon rose just before my regular Sunday shift at the Observatory, and I spent much of the next five hours glued to the eyepiece. As is always the case at close perigees, there was a very favourable libration of latitude with the north polar region very well displayed. I descended into polar craters by the score - Byrd, Peary, Nansen, famous polar

explorers all, memorialized in just the right location. My recently acquired Atlas of the Moon (Rükl, 1991) served as a trusty guide, as I navigated the oblique slopes of the lunar limb. Arriving home after midnight I decided I was having so much fun I simply had to carry on from my back deck, deep into the night. By night's end I had logged seven hours of eyepiece time, seen 38 of the Moon's more elusive features, developed a ghost image in my right eye, and had a Great Idea.

There was nothing in the remarkably detailed Rükl atlas that seemed beyond the capability of the amateur scopes at my ready disposal. Why not go for the whole ball of cheese? There were about a thousand named features on the lunar nearside (Table 1). At the time the Rükl atlas was being remaindered in one of the chain bookstores, dirt cheap. I picked up a few extra copies, donated a couple, gave some as gifts, and decided to keep two for myself, a "desk" and "field" edition. The latter would accompany me at the eyepiece for the next decade, serving as both guide and log.

My original plan was to accept Rükl as my gospel, work my way through all 76 maps and try to observe every named feature. I figured it would take at least two years; in reality it took eight.

I did almost all of my observing from downtown Edmonton, using either my own 8-inch f/8 Newtonian/Dobsonian with excellent optics by Cave, or, during my shifts at the Observatory, the RASC Edmonton Centre's 7-inch f/9 Astro-Physics Starfire refractor with excellent optics by Roland Christen. A 7-mm Nagler in each location yielded fields of similar size, scale, and brightness. The Nagler's generous 82-degree field allowed lots of context for the developing skill of "crater hopping," and in my unguided Dobsonian, the luxury of a few extra seconds before having to realign the view. At higher power (~230x in either case), I was able to avoid the brightest areas near the subsolar point and therefore work without any kind of filters. It's not as if dark adaptation was an issue; eventually I began leaving the (red) porch light on so I could more easily read my atlas.

Table 1.

Number of named features on the lunar nearside illustrated by Rükl, 1991

Craters		814
Catena	crater chain	8
Dorsa	system of wrinkle ridges	16
Dorsum	wrinkle ridge	19
Lacus	lake	17
Mare	sea	20
Mons	mountain	23
Montes	mountain range	18
Oceanus	ocean	1
Palus	marsh	3
Promontorium	promontory	9
Rima	rille	38
Rimae	system of rilles	47
Rupes	scarp	7
Sinus	bay	11
Vallis	valley	11
Total objects		1062

"From night to night in its march across the sky I watched the moon grow from a slender sliver in the west to a full-orbed globe above the eastern treetops. On some of those nights I saw strange lights offshore in the sea of darkness that ebbed before the line of sunrise creeping out across the moon. An hour later these weird points of light had turned to mountain peaks and crater rims as the rising sun slid down their slopes toward the still dark plains below."

The Moon is a weatherless, geologically inert world. I like to tell visitors to the Observatory that it's so dead its features have been named in Latin! Observation of it is nonetheless dynamic, thanks to the ever-changing illumination angles as it orbits Earth. As Peltier points out, the best "action" can be seen along the terminator, where the Sun rises on the waxing Moon (or sets on the waning) at the inexorable rate of 1/2 degree per hour. I learned to concentrate on the strip near the terminator, where long shadows provide definition, depth, dimension; indeed, it was only when I began to consciously observe the shadows themselves that I felt I was becoming an accomplished lunar observer. Absence of information is a different form of information, and it helps to closely examine where the light *isn't*.

I particularly enjoyed those occasions when I could observe the waxing Moon on consecutive nights, preferably several in a row. Features explored near the terminator one night served as familiar landmarks guiding the way to new features revealed on the next.

Over time, I began to gain a few tricks. Thanks to Alister Ling's wonderful Lunar Calculator program that he (not coincidentally) began to develop around that time, I could determine the selenographic colongitude as well as the current libration. If, say, the south pole was more favourably exposed, I would start there and work my way up. Given Rükl's (inexplicable) decision to lay out the charts horizontally, I would clip the pages together in order to easily flip through that night's terminator. I manually cross-referenced lunar landing sites and areas featured in the photographic section of the book in order to give each area more detailed study. Each night I would choose a pen of a different colour than those already used on those pages so that I could quickly review my night's work, which consisted primarily of check marks and dates beside the various features. Over time I began to add more and more notes, especially of anonymous features that somehow caught my eye. As much as possible, I tried to observe central features on both morning and evening terminator.

I always made sure I took the time to read the little thumbnail bios provided by Rükl for each named feature; it was like a short history of science, exploration, and discovery. Did you know there are six Canadians memorialized on the Moon? They are Avery, Banting, Beals, Daly, Newcomb, and Plaskett, the last two of whom are also commemorated with RASC medals.

My pace was rapid at first, over 400 features seen in 1993 alone. It was virgin territory, and features that proved difficult I just tended to leave until later in my rush to see the highlights. Of course, "later" eventually caught up with me, as

I had to wait for just the right phase to occur under clear skies and a clear schedule to clean up the leftovers. Often I would observe for an hour or more to bag a single feature, or none at all. My summary comments often said things like "Foiled again on Rimae Sharp and Suess" or "Frustration in Mare Smythii."

Eventually the list got whittled down. On May 15, 2000 I finally observed sections of the elusive sinuous rille Rima Suess. (My notes read: "C-14, averted vision. VERY! TOUGH!! INDEED!!!") It had taken almost eight years, 105 observing sessions, over 150 hours of eyepiece time, but I had seen every feature on the lunar nearside. Phase One of my lunar project was complete.

"Throughout these nights of discovery and exploration of the moon one question kept recurring to my mind. Why had I been denied all this until my school years were so nearly spent? Why had it not been made a part of the growing up of every youth? I had been taught the rivers, the seas, the mountains of every continent on earth. I knew the capitals of every state and country in the world. And all this time, right above me, the "geography" of a whole new world had been turning, page by nightly page, and no one had opened up the book for me. This was not negligence peculiar to those times - it still exists. In later years with other telescopes I was to show the moon to thousands of visitors of all ages and not one knew the name of a single mountain range or crater on the moon!"

Forty years have passed since these words were written. Humankind has gone to the Moon, come home safely, and promptly forgotten it. I too have shown the Moon to thousands of visitors of all ages, and can attest that only one feature is widely recognized by name, the Sea of Tranquillity. Occasionally dropping a name like Ocean of Storms or Fra Mauro or Hadley's Rille will cause a momentary glimmer of recognition across the face of people my age or even older, but more often I will encounter a young person who is completely oblivious to the technological triumph that was Apollo.

Photo: Villy Madsen, Edmonton Centre

Or, worse, who asks me if the moon landings were faked. (Applying the principle of Occam's Razor, my rejoinder is typically, "Do you really think 'they' would have faked SIX of them?") Even many of my fellow amateur astronomers turn their telescopes elsewhere or leave them in the closet when the Moon is in the sky, offering its free geography lessons to all who take the time to look.

Over those forty years, both Starlight Nights and Atlas of the Moon - two of my favourite astronomy books ever - were somehow allowed to fall out of print. Thankfully both oversights have recently been rectified by Sky Publishing. There's a handsome new Rükl atlas, featuring a few upgrades and the addition of some recently named features honouring people I can actually remember like von Braun and Shoemaker. For budding lunar observers interested in lunar geology, Charles Wood's engaging book *The Modern Moon: A Personal View* is offered as a companion volume.

Better still, the National Observing Committee has developed the Isabel K. Williamson Lunar Observing Program, honouring a legendary member of the Montreal Centre and featuring 150 areas of the Moon sensibly arranged by longitude. For details, go to `www.rasc.ca/observing/moon.html`.

The ever-gracious Chris Fleming of NOC agreed to recognize past documented observations towards the new program, so after an enjoyable review cross-referencing the two, I understand I am to be the first recipient of the I.K.Williamson Certificate. What can I say? The twelve-year head start helped a bit.

But for all the shiny new books and baubles, my trophy remains my battered, weather-beaten Rükl field edition. It's nothing special to look at: pages stained by ink and dew and the inevitable coffee spills, corners worn, cracked binding lovingly repaired by packing tape. But I can open to any page, see the map, read my notes, and be teleported back to times well spent with the beautiful girl next door.

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Alister Ling'sLunar Calculator program can be found atwww3.telus.net/public/aling/lunarcal.htm

Bruce McCurdy has been a certifiable lunatic for as long as anyone can remember. Now, it's official.

Ring of Fire at 25,000 Feet

by Peter Ceravolo, Ottawa Centre (peter@ceravolo.com)

Total solar eclipses have inspired feelings of awe and dread in humankind for thousands of years. Often eclipses were thought of as harbingers of doom, but today most people recognize them as awe-inspiring events of nature. Although I have been an astronomy enthusiast for almost thirty years, I had never seen a total solar eclipse since they typically happen in far-flung places. While the experience is often described as "astronomical," so too are the travel costs.

On August 11, 1999 a total solar eclipse was to be visible over most of Europe and the Middle East. Many avid eclipse chasers planned to travel great distances at significant expense to view the eclipse in the usual method - from the ground. But the path that the eclipse was to follow on the Earth's surface began off the coast of New England, south of Nova Scotia, over the Atlantic Ocean. A friend of mine, Dennis di Cicco of *Sky and Telescope* magazine, who works out of Boston, realized that an aircraft could fly out to and along the relatively nearby path of totality to view the eclipse at sunrise. When Dennis could not interest a commercial carrier to partake in the eclipse, Mitch Sayare, another who is not only an astronomy enthusiast but also a pilot, suggested we view the eclipse from his pressurized jet-prop Twin Commander airplane, capable of cruising at 300 knots at high altitude. The plan was hatched! Dennis calculated the flight path, Mitch provided the airplane, and I weaseled my way on board as an observer.

Solar eclipses do not last long, ranging from seconds to, at most, seven minutes. At the point where we were to view the eclipse the duration would only be 50 seconds.

The adventure started the afternoon of August 10, flying my Cessna 150 from Smiths Falls (near Ottawa) to Hanscom Airport in Bedford, Massachusetts, where Mitch's plane was hangared. Jet Aviation, the ground service agency at the airport is well acquainted with executive aircraft - they throw out the red carpet before you open your airplane's door. Well, there was no carpet for my lowly two-seat trainer and I'm glad they didn't ask me to wipe my feet before I stepped onto the tarmac! As the Moon's shadow would be traveling considerably faster than our plane, we had to be at the first eclipse waypoint ahead of the shadow or we would never be able to catch up to it. That meant that we had to be in the air by 4:00 the next morning. Dennis informed us that we would not be showering for fear that the excess humidity from our clean bodies might frost over the windows.

Figure 1 – Dennis diCicco, Mitchel Sayare and Peter Ceravolo in front of Mitch's Twin Commander turboprop aircraft. The high altitude capability andlong range of the aircraft made the solar eclipse flight over the Atlantic Ocean possible.

Takeoff was uneventful and the flight was proceeding normally when Mitch turned to me with an expression on his face that suggested alarm. There was an unusual smell in the cockpit - not the sort of thing you want to have happen while cruising at night over the Atlantic Ocean. After a few tense moments, Mitch concluded that it was not a burning smell, so we could safely continue.

The smell reccurred several times, and soon Mitch was convinced that we had to find out what it was. A cabin check revealed nothing unusual. Everything looked fine in the cockpit - until Dennis ran his fingers across the dash and discovered that the compass was leaking fluid. We were relieved it was nothing serious, but Mitch wanted to soak up the fluid before it reached the avionics. I grabbed a spare pair of socks from my bag and Mitch wedged them under the compass. I now had a wonderful view of the eclipse as well as my white socks, which stand out prominently in all my cockpit photos of the event.

When viewing anything astronomical, one is at the mercy of clouds. This is especially

Figure 2 – The low height of the Sun above the horizon and the Moon's shadow caused slivers of dawn to appear on either side of the Sun. This image was taken with a pocket film camera and no flash. The relatively long exposure brought out the outer corona and the Moon's distinct shadow cone.

Figure 3 – The eclipse seen from the aircraft cockpit gave the impression of being in spacecraft and witnessing a celestial wonder. This image, taken with a flash to force a shorter exposure, brings out the inner corona, the aircraft cockpit and of course, my white socks jammed under the leaking compass!

true of a solar eclipse, which is a fleeting event and for which you may have spent a lot of money in the hopes of seeing it. Viewing a total solar eclipse is much like high-stakes gambling. Travel costs can reach thousands of dollars for an event that lasts minutes, so many eclipse chasers combine the astronomy with a vacation to justify the expense. In 1999 many people in Europe were clouded out and saw nothing, while most of the Middle East was clear. We, flying at 25,000 feet, had better a chance, but our sunrise eclipse was subject to clouds nonetheless, especially considering the amount of atmosphere that would lie between the horizon and our aircraft. A bank of cirrus clouds in the distance could raise the apparent horizon and block, or at least compromise, our view of the rising Sun. Up to the last minute we were prepared to abort, but when the critical moment came we were lucky and the horizon was clear.

Sunrise was a bit strange - the Sun looked odd because it had a big bite taken out of it. We viewed the partial phase with eclipse goggles provided by Dennis. As the Sun's disk narrowed to a sliver we removed our goggles and watched the total phase of the eclipse in all its glory. The sudden darkness, the corona, and the wedges of dawn on either side of the Moon's shadow were eerie; nothing I had ever seen compared to this. It looked very much like a special effect in a science-fiction movie. Dennis, a veteran of more than a dozen eclipse trips, would later remark that, because of the lack of haze at the high altitude, the colors were the most intense he had ever seen. The Moon's shadow was also the most sharply defined he had ever witnessed, expanding outward from what seemed like a hole in the sky. It was our high-altitude vantage point coupled with an eclipse near the horizon that created the stunning visual effects. Too soon it was all over. The predicted length of the eclipse was only 50 seconds but it seemed a lot shorter!

Viewing the eclipse in the same general area were a cruise ship and several other aircraft, the latter of which were, fortunately, at different altitudes as I am sure the pilots were also concentrating on the eclipse! All reported a clear view.

Although I have seen countless pictures of eclipses over the years, none can compare to the real thing. I count myself fortunate to have had the opportunity to see that eclipse. To have seen it from an airplane provided one of those rare moments of harmony in life, the convergence of two great passions.

Peter Ceravolo got back into flying seven years and 1,000 flight hours ago as a diversion from a lifetime's preoccupation with optics and astronomy, only to have the two great passions converge!

When It Comes to Astronomy, Bigger is Better

Canada ushers in a new era of astronomy backed by a new class of telescopes

by Suzanne Taylor, Ontario Science Centre (suzanne.taylor@osc.on.ca)

It's difficult to imagine a greater revolution in thought than the one that has occurred in astronomy during the past hundred years. A mere century ago it was believed that our galaxy was the sole occupant of a static Universe. Faint, wispy smudges in the night sky were simply clouds of gas floating around within the Milky Way, and the eight planets (Pluto was discovered in 1930) of our Solar System were the only eight planets that inhabited the vastness of space. Today we know that our Milky Way is but one of billions of galaxies in our Universe, which is not only expanding but accelerating in its expansion, that hundreds of billions of stars populate our Galaxy alone, along with such weird objects as black holes and dark matter. The nine planets of our solar system are only a handful compared to the more than 150 exoplanets that have been discovered, and the possible billions of others that we have yet to detect. Throughout the past century Canada has played its part in contributing to this mind-boggling evolution of understanding, often at the forefront of some of the most important discoveries made. With the construction of the 1.8-m Plaskett telescope at the Dominion Astrophysical Observatory in 1918 - for a time, the world's largest optical telescope - Canadian astronomers made valuable contributions to the understanding of stars and our place in the Milky Way. Since it saw first light in 1979, results from the 3.6-m Canada-France-Hawaii Telescope (CFHT) - the best in the world at that time and still considered better than many larger telescopes - have contributed to our understanding of the evolution of stars, galaxies, and the very nature of the Universe. Today, however, we are in the midst of the 10-m telescope era, and in recent years, without a 10-m-class telescope of its own, Canada has fallen behind in its access to the world's best optical instruments. What's more, the past ten years of astronomy have given astronomers a glimpse into a whole new world of questions and puzzles whose answers lie beyond the reach of even the largest telescopes of our time. The solution? Build a telescope that defines a whole new era of technology.

Canada is about to take its next major leap forward with the creation of the Thirty Metre Telescope, or TMT, an optical/infrared telescope that will belong to the new class of Extremely Large Telescopes (ELTs). The TMT will help to answer some of today's most intriguing questions, such as determining the characteristics of extrasolar planets, examining the nature of dark energy, and studying the processes involved in planet, star, and galaxy formation. Currently in its detailed design phase, the TMT, which will eventually be renamed by its sponsors, is scheduled to begin construction in 2009 and be fully operational by 2015.

Despite receiving a share of time on some major telescopes, Canada hasn't led the development of any of the three 10-m-class telescopes being used today. While Canadian astronomers have managed to produce some of the most important contributions to the field using other telescopes, they've had little or no say in determining for what kind of scientific projects these new telescopes will be designed to perform. Some Canadian astronomers believe that without this kind of lead role in a top-rate observatory, the country will only continue to lag behind as other institutions move beyond the era of the 10-m telescope and into the next generation of instruments.

For the past several years, Ray Carlberg, a professor of astronomy at the University of Toronto and a member of the Board of Directors for the TMT project, has been advocating the need for Canada to not only have access to, but to play a major role in building and designing an ELT in order to remain at the forefront of astronomy. What began with a report in 1999 quickly turned into backing from a nation-wide team of fifteen universities and eventually led to funding and partnerships with other institutions and groups who shared an interest in an ELT project. The TMT has developed into a joint project between four groups and institutions, both public and private, including ACURA, (Association of Canadian Universities for Research in Astronomy), which was formed specifically for the TMT project, AURA (Association of Universities for Research in Astronomy), the California Institute of Technology, and the University of California. Two other Canadian groups will also contribute to the project: the National Research Council's Herzberg Institute of Astrophysics will lead the development of one of the main instruments, and AMEC Dynamic Structures, an industry expert, will build the enclosure and supporting structure of the telescope. The site of the telescope

hasn't yet been decided, but the team has identified six possible locations that meet the various requirements for a major observatory: four are in Chile, one is on Mauna Kea, and one is in northern Baja, Mexico, a site that was also considered for the CFHT thirty years ago.

Why is the era of the 10-m telescope now giving way to the next generation?

There are a few different factors that have made a project like the TMT both desirable and possible at this point in time. As Dr. Carlberg explains, "There are completely new scientific justifications for building an ELT, and those questions involve key aspects that are really beyond any existing telescope." There have also been two major technological advancements in recent years that make an ELT feasible. The first of these is the segmented mirror, a technology employed by today's very largest telescopes, such as the two Keck telescopes atop Mauna Kea. Instead of using a single, massive piece of glass that could sag under its own weight, the TMT's primary mirror will consist of more than 700 separate, individually-supported hexagonal mirrors. This configuration not only cuts down on the collective weight of the mirror, but because commercially available mirrors can be used for the smaller, individual pieces instead of constructing a highly customized larger piece, using a segmented mirror also cuts down tremendously on the overall cost. The second technological breakthrough is adaptive optics, a relatively new technology that allows for space-quality observations from the ground by continually contorting one of the optical elements of the telescope, usually a secondary mirror, to correct for the distorting effects of the Earth's atmosphere on the incoming light. This correction is crucial, since without the use of adaptive optics a 30-m telescope wouldn't perform any better than a 10-m one would. The TMT will employ a new generation of adaptive optics called multi-conjugate adaptive optics, which will provide more precise observations than ever before by correcting the incoming light over a large field instead of a single point. Finally there is the ever-present consideration of cost. With a price tag of $700 million U.S., the TMT will provide good scientific return while remaining affordable for its funders.

Of course the most impressive feature of the telescope will be its scale. With a primary mirror as wide as the height of a ten-story building, the colossal magnitude of the TMT will truly be an awesome sight. When built, it will become the largest telescope ever constructed, and with nine times the collecting area of the world's largest telescope to date, the TMT will dramatically further our understanding of some of the most compelling mysteries in astronomy today. At the top of Dr. Carlberg's list? Surprisingly, given that his research interests lie in the field of cosmology, it's extrasolar planets. Astronomers have been detecting planets around stars other than the Sun for the past decade, yet we still know relatively little about how these planets form and what they're like, which, Dr. Carlberg notes, makes this area of study primed for interesting discoveries, "The fields that make the most progress are the ones where we know the least, and we have a tool which will allow us to see things that we've never seen before." Although each will also function independently in different areas, the TMT will work in conjunction with the much-anticipated James Webb Space Telescope (JWST), currently scheduled for launch in 2011, and the Atacama Large Millimeter Array (ALMA), an array of sixty-four 12-meter radio antennas scheduled for completion in 2012, both of which will also incorporate Canadian contributions. While JWST will detect extrasolar planets, the TMT will study their specific characteristics and the processes by which they form in detail. The TMT will be able to resolve distances on the Earth-Sun scale in some of the closer planet-forming regions, meaning that for the first time ever astronomers will be able to see into these protoplanetary disks. ALMA, at a longer wavelength, will be able to probe the dust-obscured regions of the disks, contributing to a more complete overall picture of solar system formation. Similarly, the incredible resolving power of the TMT will be used to study star and galaxy formation in much greater detail than current technology has allowed (even with today's best telescopes, distant forming galaxies appear as indistinct blobs), as well as the effects of black holes on galaxy formation. The TMT will in fact be looking back in time to "first light," the very first stars and galaxies that formed after the Big Bang. Also at the top of the list is the study of the mysterious dark matter and even more elusive dark energy, the force deemed responsible for the acceleration of the Universe's expansion, a discovery that surprised astronomers when first revealed in 1998.

To aid in making these discoveries the telescope will be outfitted with a suite of scientific instruments, each designed to perform a specific task. Among them is the Infrared Imager and Spectrometer (IRIS), which will be able to resolve dimensions of 100 parsecs at a redshift of three and will be used to study galaxies, black holes, and solar system objects. The Wide Field Optical Imager and Spectrometer (WFOS), a Canadian-led instrument, will use two cameras at blue and infrared/red wavelengths to study galactic formation and evolution, elliptical galaxies and their globular clusters, dark matter distribution, the composition of the intergalactic medium, and to test certain physical constants to determine whether they have changed in value over time. Another Canadian-led instrument, the Planet Formation Instrument (PFI), will take the spectra of extrasolar planets, allowing astronomers to detect and determine the chemical abundances and physical characteristics of these objects. The third Canadian-led instrument is the adaptive-optics system, NFIRAOS (Narrow Field Infrared Adaptive Optic System), which will be responsible for contorting the 700+ mirrors of the telescope 1000 times per second to correct for atmospheric turbulence, something that will require an enormous amount of computing power. The fact that three of the nine proposed instruments will be Canadian-led is a major boon to Canadian astronomy, and it's something for which Dr. Carlberg and many others have striven, "This time we will play an even bigger role (than with

CFHT). We were present from the absolute outset of this project and so we will build instruments that our scientists find to be the most interesting and we'll make them work using our own people."

While we are certain to see many fascinating discoveries made within the fields of study for which the TMT is being built, we are also sure to be amazed at those most fascinating insights into the nature of our universe - namely, those that come as a complete surprise. When one thinks of the multitude of information that has been brought to us by the Hubble Space Telescope, the results of the key projects for which it was initially designed were but a few of the vast array of revolutionary findings that have reshaped our understanding of astronomy. The Thirty Metre Telescope is sure to do the same. As Dr. Carlberg puts it:

> We know we haven't seen the whole universe that's out there to be seen yet. Opening up new windows in astronomy has always led to surprising discoveries. You might think you'll look out a new window and see the same thing but the experience is that you open a new window and it's like you're looking at a new planet. We expect that TMT will be one of the landmark scientific facilities of the twenty-first century. It's really exciting.

Speaking as an astronomy enthusiast and as a proud Canadian, I would have to agree.

Suzanne Taylor holds a bachelor's degree in astrophysics from the University of Toronto and currently works on astronomy public programs and exhibits at the Ontario Science Centre. In addition to astronomy, she is passionate about writing, poetry, travel, and informal debate.

Astrocryptic

by Curt Nason, Moncton Centre

The solution to last issue's puzzle

Society News/Nouvelles de la société

By Stan Runge, National Secretary (stanrunge@hotmail.com)

In this issue, it is my pleasure to share more stories of the success of some of our members. In all cases you can see that they have dedicated a significant amount of time and effort to earn their rewards.

I'll start in the west, near the site of this year's General Assembly. On July 15 Jack Newton (Victoria Centre) and Ajai Sehgal (Ottawa Centre) discovered supernova SN2005cy from Osoyoos, B.C. This Type IIn supernova was located in a galaxy designated UGC 11241, roughly 400 million light-years away. Details of the discovery can be found in the IAU Circular 8569.

SN2005cy also happened to be the 100th supernova discovery made by the Puckett Observatory Supernova Search Team (POSS), an international team of amateur astronomers that boasts several RASC members. Both Jack and Ajai had graciously opened their homes to people attending this year's General Assembly, so many of us had the opportunity to see their observatories and the telescopes used in the searches.

On April 4, Jennifer Tigner (Ottawa Centre), a newer member of the POSS, discovered her first supernova, SN2005de in Hercules. The supernova was an 18th magnitude Type Ia supernova in galaxy UGC 11097. Details of her find are included in IAU Circulars 8580 and 8581 and a description of the discovery moment (by her proud mother) can be found in this issue of the *Journal*.

Yet another Ottawa Centre member discovered a supernova recently. Doug George, also a member of POSS, reported the discovery of supernova SN2005gk in the constellation Eridanus. The object was detected in an image dated October 4 and was about magnitude 18.5. Details can be found in IAUC 8615. Doug already has his name attached to a comet and I wonder what type of object he will find next - a Kuiper belt object or a trans-Mercurian planet? The achievements of the POSS group have even reached the pages of *Sky and Telescope* - the November issue trumpets "amateur supernova hunters hit the jackpot" on the cover.

On the east coast, Michael Boschat of Halifax Centre has been busy scanning images obtained as a part of the University of Arizona's Spacewatch program in search of near earth objects (`fmo.lpl.arizona.edu/FMO_home/index.cfm`). After examining 1,115 images, he found and reported a FMO (fast moving object) but was told, when he contacted the Minor Planet Centre's NEO confirmation page, that only two images could be found showing the object. At least three are needed for an orbit to be calculated. Fortunately a follow-up observation provided a third position and Boschat's FMO received official status as 2005 TV51. The candidate was extremely faint, and moving at 16 degrees per day. It has an estimated size of between 13 and 45 m.

I am very pleased to note that Mary Lou Whitehorne, also of the Halifax Centre, has been honoured by the Astronomical Society of the Pacific as the 2005 recipient of the Las Cumbres Award. The annual award is presented for "outreach by an amateur astronomer to K-12 students and the public". Mary Lou was presented the award at the ASP's 117th Annual Conference in Tucson, at a banquet dinner held on September 16. The citation published by the ASP lauds her contributions to the RASC's Education and Outreach Committee and her work on *Skyways*.

Apology

Our apologies to Oskar Sheynin for misspelling his name in the August issue.

The Skies Over Canada

Observing Committee News

By Christopher Fleming, London Centre (observing@rasc.ca)

Among the exceptional observers who have gained recognition since the invention of the telescope, there are only a few who can be compared to the great William Frederick Herschel. William was born in Germany in 1738 and moved to England in 1757 where he studied music and became an organist. His sister Caroline joined him in England in 1772 to work as his assistant and housekeeper. About year later, in 1773, William and Caroline took up the hobby of astronomy using a homemade telescope that William had built. Over the next several years, William continued to advance his telescoping making skills by constructing additional telescopes, and Caroline helped with the mirror grinding. They were both keenly interested in astronomy, and they regularly observed the night sky. Caroline kept records of William's observations and compiled catalogues of the astronomical data.

Although William was an accomplished musician, he also had a brilliant scientific mind that enabled him to approach the mysteries of the Universe with amazing insight. He observed a wide range of astronomical objects with incredible skill and accuracy. His accomplishments included observations and measurements not only of deep-sky objects such as star clusters, and nebulae, but also of double stars, variable stars, planets, and more. He gained fame by discovering the planet Uranus on March 13, 1781 and was soon after appointed private astronomer to King George III. With the resources of the King he was able to construct a large 1.2 metre (48 inch) reflector to add to his collection, the world's largest telescope at that time. It was a unique design, dubbed a "Herschelian," that featured a long focal length speculum metal mirror that was tilted so that the focus was off to the edge of the tube. The observer could view the sky without any obstruction of the light path from the primary mirror. Herschel went on to discover the two largest moons of Uranus in 1787 and in 1789 discovered the moons Mimas and Enceladus around Saturn.

Herschel proceeded with a systematic survey of the northern sky and catalogued more than 2,000 deep-sky objects, plus many double and variable stars. His measurements of double-star position angles revealed that they were in orbital motion. He also studied variable stars and the proper motions of some fast-moving stars. From the proper motion data he concluded that the Sun is moving through space toward the constellation Hercules. In the year 1800, Herschel discovered infrared radiation using prisms and a thermometer.

Caroline Herschel (1750-1848) continued observing the night sky after William accepted his appointment with the King, and she went on to become the first woman to be widely recognized for her astronomical accomplishments. She is credited with discovering eight comets and several deep-sky objects or nebulae. Caroline's willingness to take down notes night after night while William swept the sky with the telescope probably contributed as much to the success of his catalogue as the actual work at the eyepiece. William Herschel's only son John (1792-1871) was also an accomplished astronomer and continued studying the night sky after his father's death in 1820. The second Herschel is best known for the comprehensive survey of the southern sky that he compiled from an observing site at the Cape of Good Hope in South Africa. John is credited with the discovery of 1700 deep sky objects and 2100 double stars and is also recognized for his measurements of the solar constant and in the pioneering field of photography. John's second son, Alexander Herschel, also gained notice for his work on meteor showers.

I greatly admire the accomplishments of the Herschel family and I think every budding astronomer, and telescope maker, can derive a lot of inspiration and pride from what a fellow hobbyist named William Herschel achieved.

The Explore the Universe Certificate Program (available as a PDF file in the Observing Certificates area of the RASC Web site at `www.rasc.ca/observing`) provides new observers with a complete introduction to the night sky, including Constellations and Bright Stars, the Moon, the Solar System, Deep-Sky Objects, Double Stars, and an optional Variable-Star List. The Deep-Sky portion requires that the observer identify and record observations of twelve of the twenty-four options listed. The list includes many of the best and brightest deep-sky splendours from the Messier and Finest NGC lists. The objects were carefully chosen to be suitable for new or casual observers who may be using binoculars as their primary instrument. They are also relatively easy to find, and most of them are visible during the warmer months from late spring to early autumn.

For example, the list includes favourites like the Beehive Cluster, the Coma Cluster, the Hercules Cluster, the Eagle Nebula, the Lagoon Nebula, the Swan Nebula, the Wild Duck Cluster, the Coathanger Cluster, the Andromeda Galaxy, the Alpha Persei Group, the Double Cluster, the Pleiades, the Hyades, and several more outstanding picks.

There have been two Explore the Universe Certificates awarded since our last report, and those fine observers are

listed in Table 1. It is great to see participation in this program by observers outside the RASC, and both of these recipients fall into that category. When the Explore the Universe Certificate Program was launched, it was decided that the certificate could be awarded to members and non-members alike, and that has proven to be a good idea. I would also like to remind you of the new NOVA (New Observers to Visual Astronomy) course created by Brian Battersby and members of the Prince George Centre. The complete NOVA program, which is based on the Explore the Universe Certificate, is now available for download in PDF format in the Members Only area of the RASC Web site. It is an excellent program, and we highly recommend it.

There have also been four Messier Certificates awarded since our last report, and those talented observers are listed in Table 2.

In addition, there has been one Finest NGC Certificate awarded since our last report. That skilled observer's name can be found in Table 3.

We are pleased to announce the name of our first recipient of the Isabel Williamson Certificate for lunar observing. That outstanding observer and well known *Journal* contributor can be found in Table 4. Check Bruce's *Orbital Oddities* column this month for an overview of his lunar observing experiences. The Isabel Williamson Program was launched in May 2005 at the General Assembly in Kelowna, B.C. Since then, we have expanded the booklet to include a table of contents, an index, and a cross-reference chart to Antonín Rükl's *Atlas of the Moon*. I extend sincere thanks to Leo Enright and Doug Joyce for their important contributions to the expanded first edition. The program is available in two versions, either as a PDF file or as a printed booklet.

We have also completed work on deluxe observing forms that were custom-made for the new lunar program. They feature an individual field for each objective that includes a generous area for observing notes and a circle for drawing lunar features. I extend special thanks to Terry Millard for his work on the observing forms. Information and access to the Isabel Williamson Program and the new PDF observing forms can be found at `www.rasc.ca/observing/moon.html`. Note that access to the lunar program PDF file is available only to members via the Members Only user name and password. Members and Non-members alike are welcome to purchase the printed booklet.

Congratulations to all the certificate recipients!

The Observing Committee continues to update the Observing Sections that have been posted over the last few years. The Asteroids Section features charts containing the orbital position of several bright asteroids that will be visible in 2006. These asteroids will all be brighter than tenth magnitude during the times posted on the charts, and the charts will display nearby stars to tenth magnitude on a five-degree or greater vertical field layout. Dates for the position of each asteroid will be listed at three-day or longer intervals, and nearby bright "finder stars" will be highlighted. In many cases the finder stars are bright enough to be seen visually, and a Telrad or similar zero-power pointing device can be used to target the field printed on the charts. Otherwise a typical finder-scope or binoculars will be sufficient to find the brightest star in the field.

The Variable-Stars Section features direct links to American Association of Variable Stars Observers (AAVSO) magnitude estimate charts for Mira-type Long Period Variables that will reach maxima in 2006 and that will be brighter than magnitude 8.0. We also have direct links to charts for several other variable star types, and you will find them on the "Sample Charts 2" page. Many of the most interesting variable stars in the night sky are listed there, as well as the positions of possible novae. The Comets Section is regularly updated with charts for currently visible comets, although at times the only comets visible are quite faint. In addition, the Special Projects Section continues to be upgraded and now features significantly more resources. All RASC Observing Sections can be accessed from the following Web site address: `www.rasc.ca/observing/sections.html`.

Clear Skies!

Christopher Fleming is Chair of the RASC Observing Committee and Observers Chair in the London Centre. He enjoys all types of observing, especially Deep-sky, Lunar, Double Stars, and Variable Stars. Chris is also a musician and Webmaster of the London Jazz Society's Web site.

Table 1. Explore the Universe Certificate Recipients

Name	Centre	Date Awarded
Jeremy Booth	Corbell, Ontario	September, 2005
Stéphane Meloche	Sherbrooke, Quebec	September, 2005

Table 2. Messier Certificate Recipients

Name	Centre	Date Awarded
Robert Johnson	Saskatoon, Saskatchewan	September, 2005
Chris Anderson	Regina, Saskatchewan	September, 2005
Graham Budd	Edmonton, Alberta	September, 2005
Lynn Chetwynd	Sudbury, Ontario	September, 2005

Table 3. Finest NGC Certificate Recipient

Name	Centre	Date Awarded
Sherry Campbell	Edmonton, Alberta	September, 2005

Table 4. Isabel Williamson Certificate Recipient

Name	Centre	Date Awarded
Bruce McCurdy	Edmonton, Alberta	September, 2005

Three Park Agencies Receive the RASC National Light-Pollution Abatement Award

by Rick Huziak, Saskatoon Centre (huziak@sedsystems.ca)

Amateur astronomers have been viewing the wonders of the Universe at the Saskatchewan Summer Star Party for nearly a decade. Even from the first year it was realized that the Cypress Hills with its near pristine and very accessible dark sky was worth preserving for astronomical enjoyment.

A few years ago the idea of preserving the dark nighttime sky was suggested to park managers on both the Saskatchewan and Alberta sides of the Cypress Hills Inter-provincial Park (CHIPP). About the same time, Bob King of the Calgary Centre, and Darcy Kozoriz of the Regina Centre independently began preliminary discussions about the possibility of creating a Dark-Sky Preserve. Promoting dark-sky concepts to the park managers turned out to be a natural fit to the mandate of parks - the preservation and management of the environment for all to enjoy. Preserving the dark sky was seen as a natural and logical extension of traditional park practices. On September 28, 2004, at the annual Park Managers Conference held in the Cypress Hills, the Royal Astronomical Society of Canada and the three government agencies that operate the Cypress Hills Inter-provincial Park and the Fort Walsh National Historic Site signed a declaration that created the Cypress Hills Dark-Sky Preserve.

To honour those who worked so hard to see the Dark-Sky Preserve become a reality, the National Council of the RASC voted to present the National Light-Pollution Abatement Award to the three agencies. This award recognizes their effort in stopping & reversing the effects of light pollution and having the vision to preserve the nocturnal environment - the other twelve hours of the "Land of Living Skies" - a phrase proudly displayed on Saskatchewan license plates.

The Cypress Hills Dark-Sky Preserve, at almost 40,000 hectares, is the largest dark-sky preserve in Canada, and perhaps even in the world. The Saskatchewan side of the park has already received 100 flat-lens full cut-off fixtures to replace park-owned cobra-head lights and is working to repoint the remaining park lights to the ground. Negotiations are still ongoing to have 80 SaskPower-owned streetlights comply with the Dark-Sky Preserve lighting guidelines. Funding is now in place to have the cobra-head and other older less-efficient lighting fixtures retrofitted in the Elkwater area on the Alberta side of the Park. The Calgary Centre of the RASC recently instituted a light-bulb exchange program in Elkwater to provide night-friendly outdoor lighting to cottagers. At their Annual General Meeting held on July 24, cottage owners on the Saskatchewan side unanimously agreed to support the Dark-Sky Preserve initiative.

The Cypress Hills Dark-Sky Preserve will become a model for all provincial parks in Saskatchewan and Alberta and will have influential effects on parks at the regional and national level as well. The RASC hopes that all rural and urban areas will follow in CHIPP footsteps with improved nighttime lighting and a dark-sky management policy. Dark skies truly are worth preserving and are an essential part of our natural day/night life cycle.

The Cypress Hills Dark-Sky Preserve has received publicity in many newspapers and publications including a recent feature in the March 2005 issue of the *Canadian Geographic* magazine *Travel & Adventure Supplement*. The publicity generated by these articles is creating a new awareness of the importance of responsible nighttime lighting and a dark sky, for flora, fauna, and human health and enjoyment.

I was delighted to host the presentation ceremony on behalf of Peter Jedicke, President of the RASC and on behalf of all 27 RASC Centres across Canada. Vance Petriew, whose discovery of Comet P/2001 Q2 from the Meadows Campground in 2001 helped to inspire the Dark-Sky Preserve, presented the awards. The award recipients were: David Philips, Assistant Deputy Minister of the Environment, who accepted on behalf of Saskatchewan Parks; Rosemary Jones, Planning Team Leader who accepted on behalf of Alberta Community Development; and Cheryl Penny, Superintendent, South Saskatchewan Field Unit, who accepted on behalf of Parks Canada Agency. The

Recipients and presenters at the National Light-Pollution Abatement Award ceremony held at the 2005 Saskatchewan Summer Star Party. Back Row (L-R): Rick Goett, CHIPP Sask. Park Supervisor; Keith Bocking, Heritage Appreciation Team Leader, Alberta Community Development; David Rohatensky, Fort Walsh National Historic Site Manager; Aaron Domes, Visitor Services Officer, Alberta Community Development; Vance Petriew, RASC, Regina Centre; Melody Nagel-Hisey, CHIPP Naturalist. Front Row (L-R): Brad Mason, CHIPP Sask. Park Manager; David Phillips, Assistant Deputy Minister, Saskatchewan Environment; Cheryl Penny, Superintendent South Sask. Field Unit, Parks Canada Agency; Rosemary Jones, Planning Team Leader, Alberta Community Development; Richard Huziak, RASC, Saskatoon Centre. Photo by Darcy Kozoriz.

award recipients and their teams were reminded that they were given this award for being open to new ideas and perspectives from the astronomical community, for understanding the importance of dark-sky concepts in relation to their own environmental conservation efforts, for being leaders in preserving the night sky for us and for all future generations to enjoy, and for making our dream of a preserved, pristine dark sky turn into reality in the Cypress Hills. The presentation was followed by a long standing ovation from the star party audience.

An unexpected surprise came when Cypress Hills Park Managers Brad Mason and Rick Goett turned the tables and presented matching awards to Vance Petriew, Bob King, and me, the main RASC consultants on the DSP project. A round of acceptance speeches and project reports followed the award ceremony. Also honoured were: Rick Goett, CHIPP Saskatchewan Park Supervisor; Keith Bocking, Heritage Appreciation Team Leader, Alberta Community Development: David Rohatensky, Fort Walsh National Historic Site Manager; and Julie MacDougall, CHIPP Alberta Site Manager

RELATED WEBSITES

Cypress DSP & National LPA Award Presentation:
`www.ras.sk.ca/lpc/dsp/dsp.htm`

Saskatchewan Light-Pollution Abatement Committee:
`www.ras.sk.ca/lpc/lpc.htm`

Calgary Centre Light-Pollution Abatement Web Site:
`calgary.rasc.ca/lp/index.html`

RASC National Light-Pollution Abatement Web Site:
`www.rasc.ca/light/home.html`

The 2005 Saskatchewan Summer Star Party

by Richard Huziak, Saskatoon Centre (huziak@sedsystems.ca)

The Saskatoon and Regina Centres had a very successful Saskatchewan Summer Star Party this year. The SSSP ran August 4 through 7, though some participants came as early as July 31 and stayed as late as August 8. Even without any other star-party entertainment, clear 7th-magnitude nights from Tuesday through Saturday alone would have made this event. Sunday also stayed clear for a little while for the straggler crowd. The sky's only defects were a slight brightening from higher humidity and a small bit of aurora, but fortunately, no smoke from B.C. or Alberta forest fires, or raining pine beetles as has happened on occasional years past. With the excellent weather and warm temperatures, much observing ensued with many astronomers staying up until the wee hours of each morning.

Attendance was better than average with 259 participants, from British Columbia, Ontario, Yellowknife, Calgary, Edmonton, Saskatoon, Regina, Swift Current, Maple Creek, Prince Albert, Winnipeg, Lethbridge, and dozens of other towns across Canada. This was up about 10% over our average for the past few years. We believe the attraction was due to a number of factors: Ivan Semeniuk's presence, the presentation of the National Light-Pollution Abatement Award to the Parks Agencies, and the knowledge that the Cypress Hills generally enjoy good skies and weather. Putting on the SSSP is no trivial matter, for it involves the work of over 50 event planners and volunteers to make sure that the weekend's events happen when scheduled.

Telescopes of every size and description dotted the Meadows, with over 150 telescopes present for the weekend. Photo by Tenho Tuomi.

The Early-bird Wienie Roast at suppertime on Thursday was the first official event of the SSSP. Those who came had a good time consuming our delicious all-beef dogs. (We buy the dogs purposely devoid of chicken lips and floor sweepings for those city folk with delicate stomachs.) The wienie roast gets the group together in one place, and becomes a fun social event where you can meet everyone while it's still light out and they can be recognized.

Friday was a free day designed to provide time to enjoy the amenities of the beautiful Cypress Hills Inter-provincial Park. The Park offers swimming, canoeing, kayaking, golfing, mini-golf, hiking, or just sitting around the Meadows to partake of spirits and good conversation. Because the park offers this extra entertainment,

The Meadows Campground covers about eight acres and provides ample room for trailers, telescopes, and hundreds of observers. Photo by George Charpentier.

many participants bring their families.

On Friday evening we had a 2-hour "bring-your-own-talk" session in the air-conditioned Wapiti Room at the Cypress Hills Resort Inn, where our participants can talk about their projects over the past year. These talks included topics as diverse as light pollution, star-party announcements, off-axis telescope designs, and an Apollo display at a Christian centre.

On Friday night as darkness began, I conducted a beginner's binocular star-walk. The size of the crowd and its composition both surprised and delighted me. Most participants were the spouses and children of astronomers and they came to learn about the night sky that makes them widows and orphans on many clear nights. Most had never looked at the sky with binoculars and had very limited knowledge of the night's attractions. I walked them through a selection of naked-eye constellations to help them learn their way. We started off with easy stuff: find a star, then find the Big Dipper and practice hopping along the seven main stars, stopping at the beautiful Mizar-Alcor pair along the way. For this group of novices, nothing was too basic. One huge aid was the green laser pointer. With this absolutely essential item, pointing out stars, constellations, and little fuzzy things was easy. The green beam is bright enough that you can intercept it with eyes or binoculars and follow the beam right to its intended destination. A green laser is a godsend for working with beginners.

After a half hour or so, with the group getting pretty expert at star hopping, the binoculars came out and we progressed to the deeper sky, viewing the Coathanger, M31, the North America Nebula, M27, the Double Cluster, and then worked though some dark nebulae in the Aquila Milky Way before running down the Scutum-Ophiuchus-Sagittarius Messier-fest. They were amazed at what surprises the sky held! Aren't we all?

While the binocular walk went on, the more hardened astronomers began their own observing programs or visited everyone's scopes to get different views of their favourite objects. When a light auroral glow appeared, we were a little disappointed, until the aurora formed itself into an unusual band extending from the northwest horizon, to overhead, then onward to an end at the east horizon. It manifested itself as a bright and perfectly straight band about two degrees wide. It just hung there, looking like a luminous green contrail, and never deviating from perfect straightness. After about thirty minutes the band started to move slightly southward, dropped a few short rays northward and soon disappeared.

A groggy Saturday began with a swap meet: scopes, eyepieces, accessories, and the occasional telescope were up for the best-bartered price. There was a bit of time to scratch up a midday lunch, and then it was off to the afternoon talks. Alan Dyer of the Calgary Centre tempted us with video footage from his latest solar-eclipse expedition to Tahiti and then found time to stitch together an excellent video of the strange aurora over the Meadows observing site the night before. Alan always puts on a spectacular show! Paul Campbell of the Edmonton Centre gave a great talk on his AAVSO Sudden Ionospheric Disturbance (SID) program, describing how he detected the Sagittarius magnetar this past January as its intense burst ionized the top of the Earth's atmosphere. Paul's work is featured in both *Sky & Telescope* and on the AAVSO Web site.

Saturday afternoon also saw the presentation of the RASC National Light-Pollution Abatement Award to the three Park Agencies - Saskatchewan Parks, Alberta Community Development, and Parks Canada - who signed the September 28, 2004 declaration that created the Cypress Hills Dark-Sky Preserve. The presentation was pretty emotional, involving a few tears of joy and a standing ovation for the nine Park personnel who decided that preserving the nighttime sky should be a priority. An unexpected turn came when Cypress Hills Park managers Brad Mason and Rick Goett then turned the tide and presented matching awards to Vance Petriew, Bob King, and myself, the main RASC consultants on the DSP project. The DSP received some press from this event, including a CBC Radio interview on Thursday morning and some coverage in the Maple Creek, Kamsack, and Regina newspapers.

Ivan Semeniuk delivered the Father Lucien Kemble Memorial Lecture. Ivan's talk was entitled "Seven Planets in Seven Days." The talk explained the Roman origin of the names of our seven-day week and how spacecraft are now exploring the seven original planets that the Romans honoured so long ago. We were lucky to have Ivan at all, as he was in the middle of a move from Toronto to Boston and a job change that takes him from his Daily Planet reporting to U.S. Editorial Bureau Chief for *New Scientist* magazine.

Just before we adjourned for supper, the door prizes were given out. I would be remiss if I did not thank the Science Shop of Edmonton, SkyVue Telescopes of Calgary, Island Eyepiece and Telescopes, Glen Scrimshaw Galleries, Celestron, Phase II Photographic, and all the other businesses and individuals who donated great items so generously.

The keynote lecture was followed by a catered banquet in the Wapiti Room. This banquet is greatly appreciated by the star-party participants as the weekend otherwise consists of a lot of meals charcoaled over campfires. The last official

event on the agenda is a Scope Walk-Around Social held in the Saturday pre-viewing twilight. This is another chance for visiting and viewing unveiled scopes before dark.

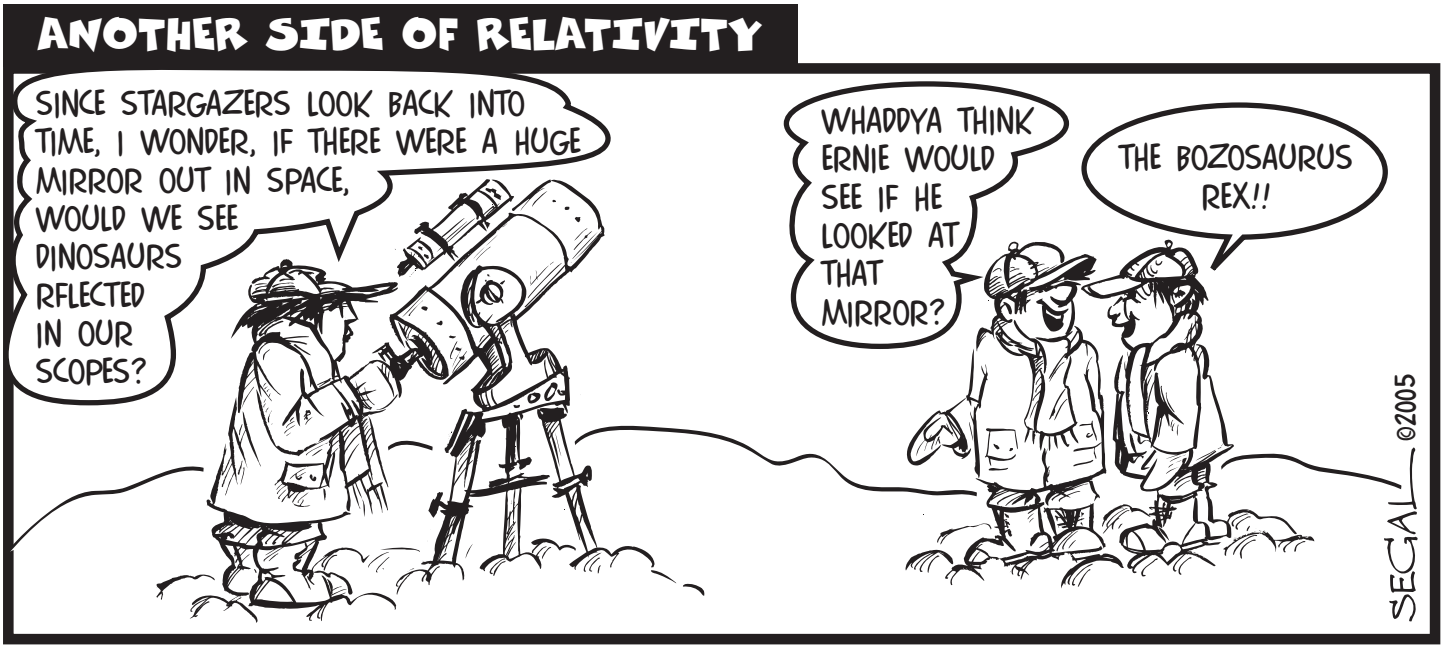
Saturday night observing was great, though as an organizer I didn't have much time to get settled until gate-security chores ended around midnight. The aurora reappeared for a short time and tried its hardest to repeat the straight band of the night before, but soon got sick of trying and faded away into insignificance. The post-midnight hours gave great views of objects that are normally hard-to-see in other skies. The 15th-magnitude Pegasus Dwarf Galaxy was held easily in my 10-inch scope and the North America Nebula was spectacular in my 8 × 50 spotter with an O-III filter, with the Pelican Nebula's full shape visible alongside. I chased down a few globular clusters in M31, and poked around the sky at other challenge objects. I also did a lot of visiting and spent time observing with Larry Wood, Paul Campbell, Donna-Lee May, Stephen Bedingfield, and other Edmonton crew members.

Just before sunup, a NOSS triad satellite group passed overhead, capping off an excellent night. A small group of six holdouts followed a yearly SSSP tradition and celebrated the end of the star party with a beer and a beautiful sunrise.

One new development that occurred at the Meadows campground this year was the installation of six streetlights. As part of a park-wide renovation to accommodate ever-larger RVs, the Meadows campground, formerly just a wide-open field, is being divided up into individual drive-through campsites big enough to accommodate the large behemoths. The Meadows is the only overflow area within the park and no existing campsites were otherwise suitable for this conversion. The streetlights were deemed necessary for safety reasons in areas where vehicles can move around at any hour of the night. Our agreement with the Park was that the lights in the Meadows would be turned off during the official SSSP dates but this meant they would be a problem for the "come early, stay late" participants. Before Thursday and after Saturday the streetlights would have to be on.

Our SSSP organizing committee did not realize the full impact of this agreement. On the upside, all lighting within the park, Meadows included, is now or soon will consist of full cut-off flat-lens fixtures that produce little scatter beyond their intended lighting patterns. The addition of power and water hook-ups as a by-product of the development means power is now available for telescopes, dew heaters, imaging equipment, and trailers, and water is available from more than one old single water spigot across the Meadows. If you set a telescope up out of the footprint, the light was not nearly as annoying as you might suspect. Larry Wood stated that even with the lights only 100 feet from his telescope, the sky was still better than Blackfoot, Edmonton's normal observing area seventy kilometres out of the city. Even so, the organizers listened sympathetically to a few grumpy observers who had set up near the streetlights and did not bother to move to a darker part of the Meadows on the off-nights. Although the lights were an unforeseen problem in this, the first year of the DSP project, the Dark-Sky Preserve created 40,000 protected dark-sky hectares, and streetlights in the Meadows affected only six on the off-nights. We will resolve the lights-off issue for SSSP 2006.

When the lights are off, there is a sky here you wouldn't believe!



Former Home to be Demolished

Toronto Centre (denis.grey@sympatico.ca) reprinted from the Toronto Centre Web page

On September 8, 2005 the Royal Ontario Museum announced a proposed partnership with Graywood Developments to demolish the McLaughlin Planetarium building in favour of a 46-storey mixed-use condominium tower. The first five floors would be office and storage space dedicated to the museum while the remaining space would be allocated to 3000 square-foot condominiums selling for an estimated $3 million each (minimum). The proposal has a number of hurdles to overcome, not the least of which is its extreme density relative to all other structures in the neighbourhood.

The McLaughlin Planetarium was the home of the Toronto Centre from its opening in 1967 through to its abrupt closure on November 5, 1995. In addition to the public planetarium spaces that hosted over six million visitors, the Toronto Centre made use of meeting rooms, a library, and a telescope-making workshop. The closure, in response to budget cuts mandated by the Harris government, threw forty support and program staff out of work.

At the time the Toronto Centre made numerous representations to the Board of the Royal Ontario Museum and protested the closure both in public and in private. Despite the appeals of the Centre and other concerned members of the community, the ROM went ahead with its strategy and quickly dismantled the facilities inside the building.

The planetarium today is a shell of its former self. The Zeiss projector has been donated to York University as a museum piece. All of the seating, wiring, and other projection facilities have been removed. The astronomy-based exhibits were uprooted and destroyed shortly after the closing. The sole exceptions are some items from the Toronto Centre's workshop (a blackboard, some signage, and paintings) that survive today at the Carr Astronomical Observatory.

The Royal Ontario Museum continues to offer mobile Starlab programs for school groups, but astronomy is clearly not a priority for the Museum in 2005. Even if the Museum was supportive, the existing planetarium building has many limitations in its design and usage that would make it difficult to operate economically. The phenomenal success of the new Hayden Planetarium at the American Museum of Natural History's Rose Center for Earth and Space in New York suggests that there is room in Toronto for a similar astronomy facility but it would be radically different in design and operating principles than the former McLaughlin Planetarium.

There is still hope for planetarium proponents. At the current time there are two groups working in the Greater Toronto Area to try and establish a new planetarium. The Toronto Centre supports these initiatives and will be actively involved in any concrete proposal to develop a new planetarium either in Toronto or in the surrounding area.

Note added in proof: An article in the Globe and Mail at the end of October reports that considerable public opposition has developed in response to announcement of the condominium plans. The project has now been terminated

RASC AWARDS: 2005 and 2006

by Rajiv Gupta (rgupta@telus.net)

The RASC has a multitude of talented and committed members. Each year the Society honours a few of them with an award. These awards are approved by National Council, usually at its first meeting of the year, based on the recommendations of the Awards Committee. As the current chair of this committee, I'm asking for your help by submitting nominations to me.

Not including observing certificates, which are administered by the Observing Committee, there are four different distinctions a member can receive from the Society: the Chant Medal, the Ken Chilton Prize, the Service Award, and the Simon Newcomb Award. A member can win more than one of these awards, but generally not more than one in a given year. Details on each of the awards are given below.

Photo caption: Past presidents Randy Attwood (middle left) and Bob Garrison (middle right) were recipients of the Service Award at the 2005 General Assembly. The awards were presented by immediate past president Rajiv Gupta (far left) and president Peter Jedicke (far right). Not present: Attila Danko (Ottawa Centre, Ken Chilton Prize). Photo by Alan Dyer.

The Chant Medal

This is the senior member of the Society's award offerings. At most one medal is awarded each year, to an amateur astronomer resident in Canada. The award is granted on the basis of the value of original work in astronomy or a closely allied field.

The award was named in honour of Professor C.A. Chant (1865-1956), who was president of the RASC from 1903-1907 and founder of the *Observer's Handbook* (of which he edited a remarkable 49 editions). It was established in 1940 and has been awarded to 26 members since then (an average of once every 2.5 years). The most recent recipient, in 2002, was Dr. Roy Bishop.

The Ken Chilton Prize

This award was established in 1977 in remembrance of Ken Chilton, an active member of the Hamilton Centre. It is awarded at most once a year to an amateur astronomer resident in Canada in recognition of a significant piece of astronomical work conducted or published recently. The award has been granted 14 times in its 28-year history (see below for the most recent winner). Four recipients of a Ken Chilton Prize have subsequently also won the Chant Medal.

The Service Award

The Service Award is the most frequently awarded of the RASC's distinctions. It was established in 1959 and has been granted to 110 members in its 47-year lifetime and to 11 members in the past 6 years (see below for the 2005 winners). The award is presented to a member who has provided substantial service of a well-defined nature to the Society and/or a Centre over a period of at least 10 years. The number of recipients from a given Centre is restricted, on average, to one every three years.

The Simon Newcomb Award

This award specifically recognizes astronomical writing by a member, either for a general audience or for an astronomical audience. It is named in honour of astronomer Simon Newcomb (1835-1909), who was born

in Nova Scotia and served for 20 years as superintendent of American Ephemeris and Nautical Almanac Office at the U.S. Naval Observatory. The Simon Newcomb Award has had 13 recipients since its inception in 1978 (roughly one recipient every two years). The award was last given to Mary Lou Whitehorne of the Halifax Centre, in 2004.

Current Winners

The following three members won awards in 2005.

1. *Randy Attwood, Toronto Centre, Service Award:* A member since 1970, Randy has provided exemplary service both to Toronto Centre, including a term as its president starting in 1983, and to the Society including a term as its president starting in 1998. Randy has also been an energetic popularizer of astronomy and space flight through multiple media appearances.
2. *Attila Danko, Ottawa Centre, Ken Chilton Prize:* Attila is an enthusiastic member of Ottawa Centre, but is known throughout North America as the co-creator, with Alan Rahill of the Canadian Meteorological Centre, of the Clear Sky Clock. Amateur astronomers rely on the over 2000 clocks, which give detailed forecasts of sky conditions, to plan their observing sessions.
3. *Bob Garrison, Toronto Centre, Service Award:* Bob is a renowned professional astronomer, specializing in stellar spectroscopy, and has been a member of Toronto Centre since 1975. He has served the Society since 1983 as the author of the section "The Brightest Stars" in the *Observer's Handbook,* and was the president of the Society from 2000 to 2002.

For the names of other winners in the past few years, see recent issues of the *Annual Report*.

2006 Nominations

The deadline for nominations for recipients of awards in 2006 is January 31, 2006. Nominations can be submitted by any member or group of members, but in the case of a Service Award approval of the nomination by the Council of the nominee's Centre is encouraged, if the nominee is attached to a Centre. Please help the Society recognize outstanding achievement by its members by sending your nominations to me, by email, by the submission deadline.

CALL FOR NOMINATIONS — PRESIDENT, FIRST VICE-PRESIDENT, AND SECOND VICE-PRESIDENT

The three presidential positions named above will be filled by election or acclamation at the RASC Annual Meeting on May 21, 2006. Names of candidates must be presented to the Secretary at least 60 days prior to the Annual Meeting by the RASC Nominating Committee or by a private nomination supported by the signatures of five members of the Society. As chair of the Nominating Committee, I invite you to send suggestions for these positions to me for the Nominating Committee's consideration. Please send any suggestions by email, no later than January 31, 2006.

The duties associated to these positions are specified in the Society's bylaws, which are available in the password-protected portion of the RASC Web site.

Rajiv Gupta
Chair, Nominating Committee
rgupta@telus.net

In Memoriam: Frank Smith (1923-2005)

by Ray Khan, Toronto Centre

My dear friend and colleague Frank Smith would always lament that "Computers do not buy telescopes Ray, people do." Frank saw the advent of the PC in most workplaces as a tool that replaced individuals, thereby reducing employment. What would I do when "all your customers are replaced by computers? How many telescopes will you sell then?"

Frank was from the old school. Born in Southend-on-Sea in the United Kingdom, he had lived through World War II, as he often liked to recount. Frank would usually pop into the store twice a week, on Wednesdays and Saturdays, to help customers with their telescope purchases and to share his passion and enthusiasm for astronomy. He would also share his avid knowledge of World War II strategies. Not to mention his searching for the best fish & chip shop in Toronto, that tasted as good as "over 'ome", as Frank would say.

As commercial amateur telescopes started to become computerized, Frank would often shake his head. He suggested that customers start with a Dobsonian scope, or an equatorially mounted 6-inch scope (his personal favorite), learn the sky and forget about the heavily advertised computerized "GOTO" telescopes. Being a former machinist by trade, retired from Ford Motor Cars, Frank also did any custom machining work required by customers who wanted this or that adaptor for their telescope equipment. He did very precise work, and would take his time to ensure the job was done correctly.

You could easily spot Frank in the store - he was the most smartly dressed, always wearing a long-sleeved shirt, cardigan, and often a tie. He had the manner of a British Gentleman. Many customers remarked on what a pleasure it was to deal with such a polite and knowledgeable individual. When youngsters came into the shop, he would be very patient and treat them with the utmost respect and help them choose an instrument best suited to their needs.

Frank Smith

Frank encouraged folks to come out to the public-observing nights hosted by the Toronto Centre of the RASC. He would be present at most of these events, always inviting people to look through the telescope eyepiece and then patiently explaining to them, in detail, just what it was they were observing.

Frank was also a Friday and Saturday night regular at the David Dunlap Observatory public tour nights, setting up his telescope on the lawn in front of the large dome and inviting the public to have a "look see." His enthusiasm never waned. And of course he was a regular attendee of the Toronto Centre RASC meetings, twice a month. He was always excited when summer rolled around, looking forward to the annual Starfest star party held in Mount Forest. He would camp out for a week, in his "hotel style tent" as I would call it. Then in the fall, it was off to the "Annual Algonquin Adventure" star party. Frank was an avid volunteer at the Toronto Centre RASC booth at the Annual Hobby show for several years.

Like most amateur astronomers, Frank usually obtained a new telescope once a year or so. Something more portable, or with a bigger aperture. It was memorable when his last telescope, an 8-inch f/6 Sky Mentor Dobsonian, acquired a computerized digital setting circle. Frank was having difficulty spotting some of the fainter stars through his finderscope and Telrad finder and decided a digital readout with "push to" would be the answer. The 150-page manual with the unit was a bit daunting, but in the end Frank mastered it and so joined the "computer age" at last!

All of us at the shop, and many RASC members and customers are truly grateful to Frank Smith for sharing his passion for the night sky and friendship with us! He was truly an inspiration to young and old alike! We will have many lasting memories for years to come.

Ray Khan
Khan Scope Centre
Toronto RASC

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CENTRE ADDRESSES/ADRESSES DES CENTRES

The most current contact information and Web site addresses for all Centres are available at the Society's Web site: **www.rasc.ca**

Belleville Centre
118 Bridge St E, Belleville ON K8N 1M5

Calgary Centre
c/o Calgary Science Centre, PO Box 2100 Station M Location 73, Calgary AB T2P 2M5

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PO Box 842 Station B, London ON N6A 4Z3

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c/o Dr. Francis Leblanc, Departement de physique et d'astronomie, Universite' de Moncton, Moncton NB E1A 3E9

Centre francophone de Montréal
Casier Postal 206, Station St-Michel, Montréal QC H2A 3L9

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PO Box 1752, Station B, Montreal QC H3B 3L3

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1363 Woodroffe Ave, PO Box 33012, Ottawa ON K2C 3Y9

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7365 Tedford Rd, Prince George BC V2N 6S2

Centre de Québec
2000, boul Montmorency, Québec QC G1J 5E7

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c/o Randy Dodge, 206 Frecker Dr, St. John's NL A1E 5H9

Sarnia Centre
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PO Box 317, RPO University, Saskatoon SK S7N 4J8

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286 Trinity Cres, Thunder Bay ON P7C 5V6

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c/o Ontario Science Centre, 770 Don Mills Rd, North York ON M3C 1T3

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1100 Chestnut St, Vancouver BC V6J 3J9

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c/o David Griffiths, Treasurer, 333 - 1900 Mayfair Dr, Victoria BC V8P 1P9

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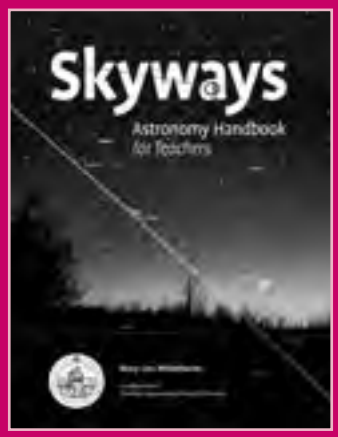

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