

# NOVA

NEWSLETTER OF THE VANCOUVER CENTRE RASC  
VOLUME 2015 ISSUE 5 SEPTEMBER/OCTOBER 2015



## Perseid Meteor Shower Watch at Aldergrove Lake by Leigh Cummings

“The best laid schemes o’ mice an’ men [often go awry].” The words of Robert Burns (English translation) express well how things went on August 8th, the night of the Metro Parks annual Perseid Meteor Shower Watch at Aldergrove Lake Regional Park. All the hard work that the Metro Parks’ staff and volunteers put in was unduly rewarded with a cloudy night on the one day of the month we all wanted it clear. Despite the turn of bad luck, they soldiered on.

Photo by Elena Popovici



Metro Parks’ Kevin Dack and Jill Deuling with their staff must be commended for the incredible amount of work they put into this event each year. Last year, with a

clear sky, there was a huge turnout of families to experience the park and sky at night. This year, the turnout was much less due mainly to the overcast sky. Those families that

did come out still got to experience all the entertaining events that the park staff had organized to make the night fun and special for the children and the child in all of us.

The Royal Astronomical Society of Canada – Vancouver Centre was once again playing a major role in helping out with this event. Metro Parks arranged for us to have a tent twice as big as last year’s, along with a better location for it. They also had better parking arrangements available to those with telescopes. Sadly, the special parking was not required as no telescopes were set up.

The tent, however, became the focal point for the astronomy of the night. We had three speakers give talks. I gave a talk on “Navigating the Night Sky.” Stan Greenspoon followed with a talk, “Are We Alone? The Search for ET.”

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Join us for the Merritt Star Quest from Sept. 11 – 19  
See article on page 11 for details

SEPTEMBER 10

SFU

Vancouver Centre’s Leigh Cummings presents “What kind of telescope should I buy?” Room SWH10081

SFU

OCTOBER 8

SFU

Douglas Scott of UBC presents the work he’s been doing on early galaxy formation using data from the Planck satellite. Room SWH10081

SFU

NOVEMBER 12

SFU

SFU student Elise Harrington talks about the summer of 2014 that she spent working at NASA. Room SWH10081

SFU

## Members' Gallery



### **M101, the Pinwheel Galaxy** by Howard Trottier

As seen from the Trottier Observatory at SFU. Shot over three nights at the end of May using a combined 4 1/3 hours of LRGB, and thin clouds covered the stars in the handle of the Big Dipper through a good chunk of that time. As Howard notes, "The depth of the image far surpasses anything that I thought would be possible from our suburban location, even with the big mirror."

# President's Message

Before I proceed into the President's Message, a big and heartfelt thank you goes out to Mr. Mark Eburne. Mark has been our Vancouver Centre President for 2.5 years but in August had to step down. Myself as your Vice President will take over his duties and I will be your Acting President until our AGM and elections in December. I

look forward to serving you in the months to come.

I would also like to report on recent activities within our Centre. Let me start by saying that my friends find it very funny how obsessed I've become with wanting to always know the weather forecast. They just don't understand how difficult it is to enjoy a hobby that

is so weather dependent. Adding insult to injury, living in temperate rainforest does not help.

Three astronomy events recently were heavily affected by weather.

The annual Solar Viewing event celebrated with Metro Parks was organized for Saturday, July 26 in Campbell Valley Regional Park.

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by Suzanna Nagy

## About RASC

The RASC Vancouver Centre meets at 7:30 PM on the second Thursday of every month at SFU's Burnaby campus (see map on page 4). Guests are always welcome. In addition, the Centre has an observing site where star parties are regularly scheduled.

Membership is currently \$78.00 per year (\$45.00 for persons under 21 years of age; family memberships also available) and can be obtained online, at a meeting, or by writing to the Treasurer at

the address below. Annual membership includes the invaluable Observer's Handbook, six issues of the RASC Journal, and, of course, access to all of the club events and projects.

For more information regarding the Centre and its activities, please contact our P.R. Director.

NOVA, the newsletter of the Vancouver Centre, RASC, is published on odd-numbered months. Opinions expressed herein

are not necessarily those of the Vancouver Centre.

Material on any aspect of astronomy should be e-mailed to the editor or mailed to the address below.

Remember, you are always welcome to attend meetings of Council, held on the first Thursday of every month at 7:30pm in room P8445.2 of the Physics wing of the Shrum Science Centre at SFU. Please contact a council member for directions.

## 2015 Vancouver Centre Officers

**Acting President/Events** Suzanna Nagy  
president@rasc-vancouver.com  
**Secretary/P. R./Observing** Scott McGillivray  
secretary@rasc-vancouver.com  
**Treasurer** Bruce Hutchison  
treasurer@rasc-vancouver.com  
**National Rep.** Doug Montgomery  
national@rasc-vancouver.com  
**Librarian** William Fearon  
library@rasc-vancouver.com  
**Past President/Events** Howard Trotter  
telescopes@rasc-vancouver.com

**Dir. of Telescopes** Kenneth Lui  
telescopes@rasc-vancouver.com  
**Membership** Muguette Macdonald  
membership@rasc-vancouver.com  
**Education** Bill Burnyeat, Leigh Cummings  
education@rasc-vancouver.com  
**AOMO** Alan Jones  
aomo@rasc-vancouver.com  
**Merchandise** Kyle Dally  
merchandise@rasc-vancouver.com  
**Webmaster** Rick Vandenberg  
webmaster@rasc-vancouver.com

**Light Pollution Abatement** Mark Eburne  
lpa@rasc-vancouver.com  
**NOVA Editor** Gordon Farrell  
novaeditor@rasc-vancouver.com  
**Speakers** Barry Shanko  
speakers@rasc-vancouver.com  
**At Large** Michael Levy  
Adrian Mitescu  
**Honourary President** Dr. John Macdonald  
**Trustees** Pomponia Martines  
J. Karl Miller

## Library

The centre has a large library of books, magazines and old NOVAs for your enjoyment. Please take advantage of this club service and visit often to check out the new purchases. Suggestions for future library acquisitions are appreciated.

## On the Internet

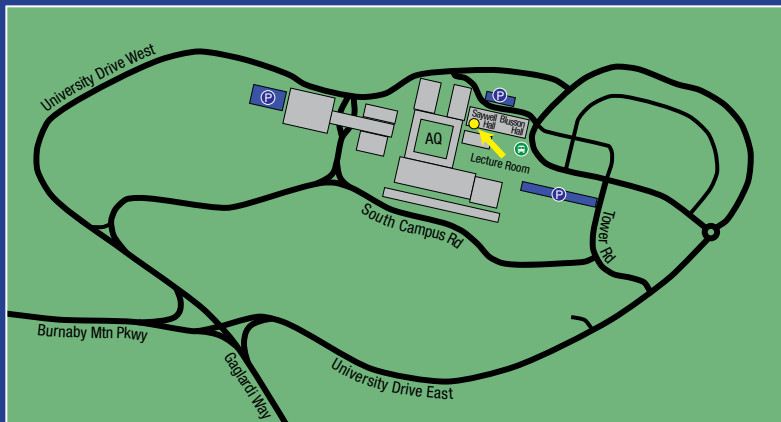
<http://rasc-vancouver.com> or  
<http://www.rasc.ca/vancouver>  
<http://astronomy.meetup.com/131/>  
<http://www.facebook.com/RASC.Van>

 @RASC Vancouver

## Mailing Address

RASC Vancouver Centre  
PO Box 89608  
9000 University High Street  
Burnaby, B.C.  
V5A 4Y0

## Map to Meeting Site



### SFU

Our autumn meetings are in room SWH10081 of Saywell Hall, indicated by the arrow on the map.

Pay parking is available at several locations around campus (indicated as "P" on the map).

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After so many months of beautiful hot weather and clear skies, the weather gods decided to make it cloudy that day. Your Vancouver Centre attended anyways and tried in vain to grab snippets of the sun during the very few sucker holes we had. Despite the sun hiding behind the clouds, we still entertained and engaged about 25 visitors.

The annual Perseid Meteor Shower celebrated with Metro Parks was organized for Saturday, August 8 in Aldergrove Regional Park. It was highly anticipated to be a great event due to the shower falling on a new moon this year. Unfortunately, after three months of drought, the

weather gods decided to make it rain that day. The event proceeded rain or shine but where 1,200 people were expected, only 300 attended. The telescopes were cancelled but your Vancouver Centre planned and continued with numerous 30-minute lectures which assisted Metro Parks greatly in keeping the visitors entertained.

The annual Mt. Kobau star party was organized for the week of August 11 through 18. Unfortunately, the weather gods sent a severe thunderstorm which caused lightening to strike and Mr. Kobau to be set on fire. Visitors to the star party were immediately evacuated and thankfully everyone

got out safely.

The ongoing support of our membership is appreciated. It is always a pleasure to see our own members showing up at our public events, giving us their support as well as often volunteering their own time to participate. Our volunteer base is strong but your Centre always welcomes new faces interested in joining our efforts at public outreach. If you wish to join our volunteer team, please do not hesitate to seek me out either in person or by email.

Let's continue to hope for clear skies. \*

Suzanna Nagy  
Acting President

## September Lunar Eclipse Preview at BCIT

by Bill Burnyeat

This September 27 will see a total eclipse of the Moon, and some readers may wonder what it will look like.

On Sept. 18, a Friday, is a chance for you to preview the eclipse. The BCIT Planetarium, in

the Institute's Burnaby campus, will be simulating what you can see on the big night. The BCIT program starts at 7 pm.

Admission is free to RASC club members and to members of the BCIT community with valid

cards.

The program will last one hour. The Planetarium at BCIT is in building SW3 in the basement. Pay parking exists throughout the campus.

See you there. \*

# The Double Star Region of Capricorn

by Bill Burnyeat

This is your travel guide speaking. Someone will be coming 'round shortly with chips and soft drinks. Remain seated. We have already embarked. You may not feel any sensation of motion. That's normal. You have all been travelling, rather rapidly, for your entire lives. Never thought about it have you? That's normal too.

Forgot to pack a bag or reserve a room? Don't worry. This is a journey of the eye and of the imagination; its destinations as near as the view out your window and as far as the meandering edge of infinity. Under wide skies, visions emerge mirroring the idylls of the rustic spot; views from cities nourish nightmares, so, that is why you scamper away. Next stop: the Goat. Please refrain from smoking until the light goes out.

I hate travel guides or science centre hosts who recite from a script, chatting of matters they don't understand or care about. Even worse is the poor jerk visited by the

chatty muse, (following too much sun), and who attempts poetry in the presentation.

It looks like we are saddled with such a sun-intoxicated narrator, probably for the duration of our tour



of the western end of Capricorn. I suppose our guide is going to retell once more, like a painfully fulfilled obligation, how the constellation of Capricorn represents an immortal that is half goat and half fish. Half-baked, that's what I call it. On the other hand, didn't Colin Thubron say it is impossible to drive out a god?

After the myth, which recites nonsense, we get the satisfied looks of those thinking they are learning something but actually they get

learning's stand-in, like educational television. They are also the ones who go running for the stale chips and pop. It's disgusting. After spilling the pop in the carpet they are glued to their little screens while wonders, in plain view, are missed in favour of cartoons.

A few of us, a very few, couldn't care less about mer-goats but have come along, bad food and all, for a taste of the more exotic species of this place. It's not rich in show objects, gaudy poster nebula and computer-enhanced galaxies. These stars hold their charms close like pairs of dancers, first together, and then they sail away from each other's embrace.

Stars with companions come in many styles, combinations and colour schemes. Nearly all types show up in just one spot, found by looking south at evening time in the late summer and early fall sky. It's called the "double star region of Capricorn."

The double stars, if I may  
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## Membership has its Privileges!

New members, did you know? The Vancouver Centre has several telescopes available for loan free of charge! We have telescopes ranging from 60mm to 10" in diameter. For more information see the Director of Telescopes after the members meeting. The loaner period is for one month, to be returned after the next meeting. Telescopes are not allowed to circulate outside of these meetings. You

can now reserve two different telescopes per year and use what is left at the end of the meeting anytime.

Your greatest opportunity as a member of the RASC is to take advantage of the company of other enthusiasts to increase your knowledge, enjoyment and skill in astronomy.

The best thing you can do to gain the most from your membership is to get ac-

tive! Take in the club meetings; engage other members with questions; come out to observing sessions (also known as "star parties"), and, by all means, volunteer to take part in our many public events.

For the usual observing sites and times, visit our website at <http://rasc-vancouver.com/observing-sites/> or contact the Observing Chair at [observing@rasc-vancouver.com](mailto:observing@rasc-vancouver.com).

# Upcoming Events

## September

11 - 19 – Merritt Star Quest  
18 – BCIT pre-lunar eclipse event  
27 – Total lunar eclipse

## November

19 - 20 – Canadian Space Summit in Vancouver

## December

10 – AGM

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Jennifer Kirky then gave an equally entertaining talk on the “Scale of the Solar System.” Her use of a roll of toilet paper as a teaching aid has to be seen to be believed. Too bad it showered or we might have been entertained with children running through the field with toilet paper streaming behind as a giant tape measure.

Adrian Mitescu, Mark Eburne and Michael Levy were there to share their expertise with the public. They also gave out literature and star wheels. Our Nova editor, Gordon, was there as well and provided me with my only view of the stars. I was standing under his

“Astronomy Umbrella” which has the night sky map on the inside of it. Elena Mitescu volunteered to be our official photographer for the night and should have special commendation for doing such a good job with a camera she had never used before and had next to no instruction on how to use. Thank you Elena!

I also should mention that another member of council, Ken Lui, manned a tent and table on behalf of the Planetary Society. It was located right next door to us. He also had lots of handouts for the enthusiastic families.

I have to finish by saying that, despite the dismal weather, we

all had fun. I got to assemble a telescope for a family that was desperate to get it functional before departing on a vacation camping trip and I know other volunteers had equally fun conversations with the enquiring public. It is a shame that more people did not come out to the park but we are used to the capricious weather of the “wet coast”. On behalf of our entire centre, I wish to extend our thanks to Metro Parks for being such gracious hosts and being so supportive of our passions as well. And a special thanks for the lovely bag of snack goodies that were handed out to every volunteer that night. ✨

## Astronomy Without Borders Pairing Program

by Suzanna Nagy

Astronomy Without Borders (AWB) is an international non-profit organization that promotes the sharing of astronomy knowledge across international boundaries.

AWB recently started a project called the Pairing Program that matches First World astronomy clubs with Third World astronomy clubs with a goal to sharing astronomy knowledge and provide mentoring.

RASC Vancouver Centre is pleased to announce that we have joined the AWB Pairing Program

and have been matched with the Astronomical Association of Jamaica (AAJ).

The AAJ was founded in 1942. They hold their monthly meetings in the Physics Department of the University of West Indies.

Initial contact was made with the AAJ in January and we established a Google Group email account to make communicating simple. At the moment, three members of RASC and five members of AAJ have joined the Google Group. We have already Skyped with them, exchanged

reports on events, and shared photos.

This is an exciting endeavour and one we hope will continue in the future with possible visits to each other’s countries. Both Vancouver and Jamaica have extended invitations to each other to visit. Maybe next year?

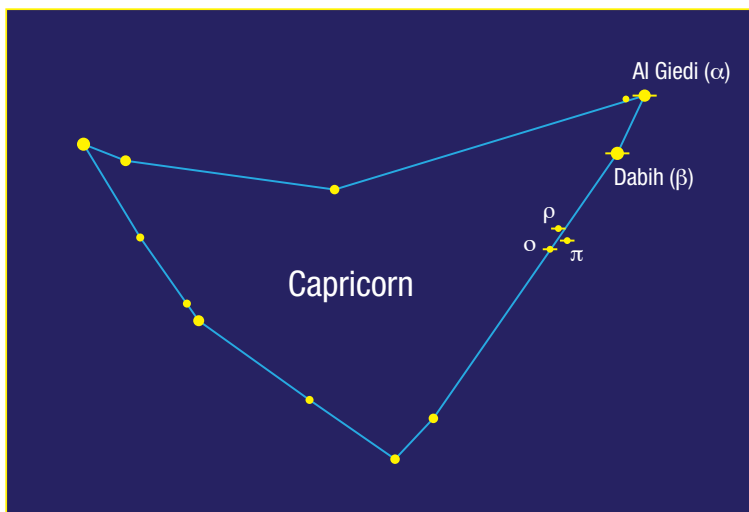
In the interim, RASC Vancouver is looking for one or two more RASC members to join this mentoring program. Please contact me at [events.rascvancouver@gmail.com](mailto:events.rascvancouver@gmail.com) if you are interested. ✨

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preamble a topic already introduced precariously, do not have a long history. Unlike comets, constellations, wars and pickled pig's feet, stars in pairs are not an obvious coat hanger on which to hang the garments of observation. It does not automatically occur to anyone that duplicity in a star is anything to be noticed. There are so many stars that it seems natural two might nudge each other by chance. Doubles, like their cousins the variable stars, are only noticed as observers ponder what they see within the project of discovering and describing star features. William Herschel was a pioneer in such work and it is not surprising that he found hundreds of double stars.

Before Herschel, only a handful were known. One of the early entries in the double star list was gamma of Aries. It was discovered in 1664. Robert Hooke, the scholar who described the pull of a weight against a spring, sometimes called Hooke's Law, was watching the bright comet in the winter of that year. As he was following the newcomer, he chanced to turn his telescope to gamma and saw it was two stars, equal in brightness, and too close for the unaided eye to discern separately. The double is still

one of the favourites of those with small scopes. I view it often in my 60 mm refractor but it is a telescopic object and remains unseparated in binoculars. All eyes were on the bright comet in 1664, so Hooke's discovery of a double star attracted only yawns. A few other doubles were spotted over the next century but always accidentally and during an observing session carried out on other business.



I first became interested in observing double stars by occupational necessity. Travelling for two decades with a telescope in parks all over British Columbia, it was my task to set up a slide talk, often placing a slide projector on a tree stump in front of a whitewashed plywood screen standing in a clearing in the woods. While darkness slowly settled over the camp, people came to hear a talk about the stars. The long twilight of summer was always a problem. Since the stars would not really shine until late, often there was a bit of a lag while everyone waited

for the sky to become truly dark. Many hours I have spent waiting for Vega and Arcturus to appear.

If Jupiter or the Moon was high in the sky, this would be the sky target before truly black skies prevailed. But if they would not show themselves, I needed something that would be more easily seen than a cluster or nebula. The double star was the perfect choice. Often Albireo, the head of the Swan, saved

the day with its strongly coloured components, of orange and blue, allowing dusk observing by families before the kids had to be put to bed. Those who stayed late would have the exotic objects but the coloured double played a strong role in keeping the line of people at the

telescope moving along.

We are watching the northwestern edge of this shield-shaped zodiac sign. Capricorn's "leader" or Alpha ( $\alpha$ ) star is here. The name is Al Giedi, from the Arabic, *يدج* (the kid-goat). It is plainly not one but a pair of stars.

The star at the head of the goat is the top of the double star region, first stop on the trip to this duplicity zone. It appears as two stars to the unaided eye and rather close together but not too close. The view can be enhanced with a pair of opera

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glasses or small binoculars.

In a very odd entry in an old book, it claims that John Herschel, the astronomer son of William Herschel, believed one of the small companions to these two stars was a planet.

Looking at the two major stars, they appear golden or pale yellow. They are not equal but not too different and the faint companions appear reddish. The view, one may persuade oneself is like a sun with a reddish satellite, the colour of an eclipsed moon the seeming hue of the little object. The small star is just that and not a planet. John may have fallen into this error through a kind of desire for symmetry with the career of his father. The elder Herschel had surveyed the skies for double stars and nebulae and had bagged a planet up in the top of the zodiac. At the Cape of Good Hope, John set up a parallel observatory to the one in England and embarked on a very similar project as his father. Since South Africa sits under southern stars, John had a chance to duplicate what his father had accomplished but under skies not accessible from the United Kingdom. Soon, John has added to the list of double stars, cluster and nebulae all found at his southern station. What about a planet? William had found a new planet high in the ecliptic, in Gemini and close to the maximum high the Sun reaches. The southern component, the tropic of Cancer contrasted with the tropic of Capricorn and it is here that John thought to spy his planet.

In a final irony, it was just across

the Capricorn border in Aquarius that the planet Neptune was first seen in 1846. But not by a Herschel.

The elder Herschel's interest in the double stars was not simply a project in adding always one more item to a limitless list; often the non-astronomer supposes discovering new stars to be the purpose of astronomical research.

Instead, Herschel wondered over a subtle experiment first suggested by Galileo. Suppose we observe two stars very near each other and of differing brightness. If the two stars are equal in true brightness, it follows the brighter member is closer. If we watch the closer member with respect to the more distant partner we should be able to see the bright one move since its motion with respect to the Earth will be larger than the more distant object. Of course this is keyed on the two stars being really identical and this, of course, is not guaranteed. If it went well, the distance to the closer star might be found by uncovering the magnitude of the motion. So, the double star with unequal components might allow the parallax of a star to be uncovered.

Herschel carefully looked down his growing list of doubles for a candidate star. He selected Castor in Gemini. The pair seemed right for the test. The primary is a full magnitude brighter than the secondary and the double is easily separated and its high elevation means it is an easy star to follow.

Herschel then measured the position of both stars with respect to the celestial sphere. This went on for a quarter of a century. Finally

Herschel noticed a pattern in the dance of the two stars. But it was not what he had hoped for. He found the stars orbited each other and that the shape of the path of one about the other was an ellipse with the star sitting at one of the foci.

This is exactly the type of motion shown by the Moon orbiting the Earth and planets going about the Sun. Herschel had discovered the laws of physics are not a locale condition but a general rule that, presumably, holds true throughout the cosmos.

It turns out that those who watched the 1664 comet but ignored doubles stars missed out on a similarity between these two topics. Comets early attracted the attention since their orbits showed with clarity the operations of Kepler's laws. Double stars do the same thing. The difference is that observing a double requires accurate work at a micrometer, a mechanical device attached to the eyepiece and allowing measurements of angles on the sky that are often very small. The comets by contrast were placed in the sky by a more rough and ready test, often without even recourse to the telescope, for a measurement on a quadrant might place the comet in a known area and with enough accuracy to calculate an orbit. Tycho Brahe did this very thing in the last decades before the invention of the telescope.

Dabih is Beta ( $\beta$ ) Capricorn, a great double that is orange and blue, and wide and bright enough to be seen in 10 by 50 binoculars. The star pair is situated just south of alpha Capricorn. Dabih, along with  $\alpha$ ,



form the backbone of the “double star” region of Capricorn.

The bright colours of the two stars are seen only in doubles. Solitary stars, of the same type show a muted hue. Certain combinations are common in the coloured double stars. Very often, a yellow or orange star is the brighter and a blue star is the fainter. Another popular mix is the red star with a fainter green companion.

This set of favoured tints does not mean that some physical rule in astrophysics is at work sorting these stars into coloured pairs. In fact, all this has little to do with the stars but involves the human eye. The colour combinations

are opposed on what is called the colour wheel, a disk, in the form of a pie chart, showing the colours. Coloured doubles tend to have tints, one from each side of the wheel with the cooler star being brighter than the hotter one.

One day, after observing in a British Columbia provincial park, I visited a pit toilet. The park outhouse is a wood structure with a corrugated green plastic roof. As I was inside, I chanced to look under the door and saw the air outside appeared pale red. When I opened the door and stepped outside the air appeared normal. What was happening was

since the light entering the outhouse was filtered to admit greenish light, the eye is rested, or more receptive to red, the opposite side of the colour wheel.

Another example is in the hallway of the planetarium. I have had red lights installed to help dark adapt the vision of patrons. Standing in the red-lit hall and looking through the window in the far door, which

is two stars that are fairly bright and widely separated, so as to nearly but not quite be approachable in binoculars. A 60 mm telescope with low power easily separates the pair. The slightly brighter member is white and the fainter of the two may appear white as well, but some observers see the secondary as pale blue.

Rho has a wide seventh mag at 4 minutes, and the star has a second companion fairly close but within the range of a 4-inch scope.

Pi requires a telescope; leave the binoculars alone, for its companion is at 3 arc seconds distant, and requires a bit of power (but not much aperture) to resolve.

The five stars and many neighbours illustrate the various features of the double star world. It contains naked-eye doubles, stars well seen in opera glasses, then binoculars, and finally a telescope.

This concludes our trip. We are leading an expedition to the Orion nebula this winter. A strong dollar, against local currencies, makes it more attractive than ever to visit this magical realm. Thanks for coming along. The bar in the Sea-Goat lounge is now open. It's a great place to relax and share experiences with your fellow travellers to the double star region of Capricorn. ★



10 by 50 mm binos (standing), 7 by 35 mm wide field binos, (reclining) and 4 by 30 mm opera glasses (white)

connects to an unlit stairwell, the view through the window seems to show the outside is tinged green. Naturally, none of this can be photographed, for, to the camera, it does not exist.

Dropping just below  $\beta$ , there is a small triangle of stars. These are Rho ( $\rho$ ), Pi ( $\pi$ ) and Omicron ( $\omicron$ ). Each star is a double. The whole of the double star region of Capricorn can be seen at once in my wide field 7 by 35 binoculars. The nearly 10° field takes in alpha, at the north end, beta just below and at the bottom, the little trio.

Easiest of the three is  $\omicron$ . Omicron

# 2015 GA Report

This year the GA (General Assembly) was held on the campus of St Mary's University in Halifax, Nova Scotia. It was a wonderful venue with tons of history and friendly people every time you turned around. The food was excellent and the campus was busy the entire conference. I would recommend this as a travel destination to everyone.

At the meeting, we were all surprised with the announcement of the purchase of SkyNews Magazine by National. Terrance Dickinson wants to retire and he

also wanted the magazine to stay Canadian. We (RASC) were the obvious choice and Terry will stay on and help with the transition. There will be little change to the operation of the magazine as it is working well with steady growth in subscriptions and monthly sales. We all are very pleased with the arrangement.

There has been a lot of work done to the website by the IT committee to meet the Canadian Anti-Spam legislation. This goes unnoticed by most so thanks to all that worked on that.

by Doug Montgomery

One of the main topics was volunteers at the centre level. At almost all centres, the same core people do all the work of running the centre. If anyone has any ideas how to change this or wants to volunteer, let anyone on council know your ideas. There is always a need for more help.

As always check the website for new programs and certificates you can achieve and a wealth of information on the Society. We belong to a very unique group and we should get all the enjoyment we can from this opportunity. ✨

Photos by Doug Montgomery



## Merritt Star Quest

Merritt Star Quest (MSQ) 2015 runs from September 11th to September 19th.

MSQ started in 2003 before it moved to its current location on Loon Lake road in 2006. It's organized and run by the Merritt Astronomical Society (MAS) which is made up of volunteers from local astronomy clubs including ours. Our Vancouver Centre members are regular attendees to this event. If you have attended before, consider attending this year and supporting the event. If you haven't been to

one yet, this is a great opportunity to experience a star party with other members of our centre.

The MAS web site is well organized, inviting and full of information. Please review the rules and etiquette so that you will be a welcome addition to the party. The main things to consider are: no lights at night other than dimmed red lights as necessary; the nights can be cold so bring and wear winter clothing at night; the days can be warm; and it has minimal facilities so come prepared. The site has great

open sky exposure, is dark, elevation is 1158 metres (3800 feet) and there is pavement right up to the site. Arrive well before dark in time to setup and enjoy, along with fellow enthusiasts, some of the best dark sky within a reasonable distance of Vancouver in B.C. Hope to see you there. Visit the website for more information including directions, fees, photos and a more complete description here: <http://www.merrittastronomical.com> \*

by Alan Jones

## What did Stephen Hawking say about Black Holes? by Scott McGillivray

Stephen Hawking is in the news again. Using fancy terms like “supertranslation” and “information paradox,” he presented the most

recent update to his theory of black holes. Every astronomer has heard of these mysterious voids in the universe where matter is swallowed into the unknown. Ask a physicist how black holes work, and you're likely to receive one of

two very different answers. The confusion is because the two most accepted branches of theoretical physics—relativity and quantum mechanics—come to very different conclusions about the nature of black holes.

The theory of relativity is most often used to describe large things

in the universe. It is based on the kinematics most of us are familiar with... equations like  $F=ma$ . Relativity states mass is attracted to

A black hole is depicted as a dark, circular void at the center of a glowing, orange and red accretion disk. The disk has a swirling, turbulent appearance. A bright, white jet of light or plasma extends upwards from the top of the black hole, tapering as it goes. The background is a dark, starry space.

other mass by gravity. The greater the mass and the lesser the distance, the greater the gravitational force. Add enough mass to a small enough space and the gravity becomes so strong that anything coming too close can never escape, not even light. Relativity concludes that anything falling beyond the event

horizon of a black hole is essentially deleted forever.

Quantum mechanics describes the behaviour of the smallest units

of the universe, things like atoms and photons and such. It describes the universe as a sum of discrete non-zero units. A derivative of this theory is the “conservation of information.” This states that information can

neither be created or destroyed. Anything that has ever existed must leave behind evidence which, given the right tools, can be reversed to recreate its former state. For example, if I had a candle in a room, there is no way to destroy it without leaving evidence the candle was

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# New Horizons

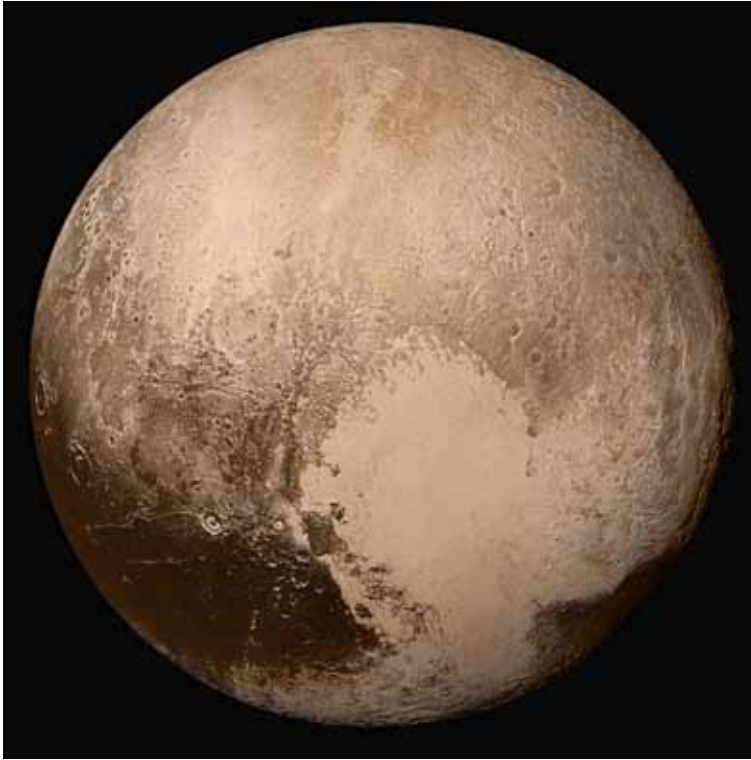
by Scott McGillivray

If there's one astronomy event to remember from 2015, it is the afternoon of July 17 when NASA unveiled the first close up image of Pluto. I was expecting a large and smooth blue ice-ball. This was a ridiculous assumption, since a methane rich atmosphere combined with solar radiation is known to produce tholins, a family of gooey brown organic molecules. How could I be so naive to think decades worth of artist renditions would be anywhere near accurate?

What exactly did New Horizons find?

Well, pretty much everything. Pluto was nowhere close to expectations and has quickly disproven a handful of theories on planetary activity. Pluto clearly has mountain ranges, vast plains, a layered atmosphere, and a lack of impact craters. These are all signs of active geology, something the experts predicted impossible for a planet of its size. The visuals we've seen so far are only the tip of the iceberg (or ice-planet).

New Horizons has seven different instruments which recorded so much data during its flyby that it will take 18 months to download it all. We can expect to hear more



updates from Pluto well into 2017.

The next target for New Horizons will be 2014 MU69, a mysterious icy object in the Kuiper Belt some 6 billion kilometres from Earth, discovered last year by the Hubble Space Telescope. It is only 40km in diameter and therefore has insufficient gravity to pull in other Kuiper Belt objects. It is likely an object this small has remained relatively

unchanged over the past 4.6 billion years when the solar system first formed. We have no idea what to expect, but we can be sure it will be the oldest object ever

observed up close and unlike anything seen before. Mark your calendar: the mysterious old object 2014 MU69 will be in the news on New Year's Day, 2019.

It's extremely unlikely New Horizons will visit a third Kuiper Belt object, as the belt's density drops significantly that far from the Sun. However, at 16.26km/s, there will be another

milestone when New Horizons "leaves the solar system" around 2035. It is believed Voyager 1 entered interstellar space in 2013, crossing the line where the solar wind and the Sun's magnetic influence become insignificant against the cosmic radiation coming from all directions. New Horizons will do the same with a much newer, larger, and healthier set of instruments than the first Voyager spacecraft. ✨

Image credit: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute

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once there. I could burn it, chop it up, or try any other means, but if you walked into the room a few minutes later, you would know there used to be a candle. There is information that a candle was once there: perhaps the smell, smoke around the lights, wax on the table, etc.

So, if relativity says black holes delete stuff without a trace while quantum mechanics says nothing can be deleted because information must be preserved, either physics is broken or we don't fully understand black holes. This inconsistency is the information paradox.

Back to Stephen Hawking. Hawking is a relativity guy and in the past has said black holes eat and destroy anything around them. However, as of a couple weeks ago, he has hinted that matter or information does not disappear beyond the event horizon after all. He is now saying information is preserved on the surface. Anything falling inward will leave a permanent 2D hologram on the event horizon, evidence of its existence, thus satisfying the conservation of information.

While this announcement made world news, it is most likely because Stephen Hawking said something

and not because it is a new development in the physics of black holes. Several others have proposed this same idea over the past 20 years, including Stanford professor Leonard Susskind in his 2008 book, *The Black Hole War, my Battle with Stephen Hawking to Make the World Safe for Quantum Mechanics*.

The August 25 announcement was a brief talk from Hawking and a preview of his updated theory. He is expected to release the official paper for peer review in late September. We can only wait to see if this is actually a new development or if the hype is simply Stephen Hawking being Stephen Hawking. ★

## July 25th Solar Observing at Campbell Valley



Photos by Doug Montgomery

## Members' Gallery



### **Moon/Venus/Jupiter conjunction** by Elena Popovici

As seen from English Bay on July 17. Jupiter is quite faint, framed by the tree on the right.



### **Moon** by J. Karl Miller

From June 1, 2006. The leftmost image taken through a Celestron C8 at prime focus, the rest using eyepiece projection.

## Members' Gallery



### The Lunar Werner X

by Elena Popovici

Captured on Aug. 20 from Galiano Island.

A composite image featuring Michelangelo's "The Creation of Adam" on the left and a figure holding binoculars on the right. The text "VANCOUVER TELESCOPE CENTRE" is prominently displayed in the center, with "Serving the Astronomers of Vancouver and British Columbia since 2004" below it. At the bottom, the names "Nickolas Seiflow and Keith MacNutt" and their contact information are listed.

**VANCOUVER TELESCOPE CENTRE**  
Serving the Astronomers of Vancouver and British Columbia since 2004

Nickolas Seiflow and Keith MacNutt  
2580 Burrard Street, Vancouver, BC V6J 3J7  
Tel: 604-737-4303 email: [info@vancouvertelescope.com](mailto:info@vancouvertelescope.com)

# CanadianTelescopes.Com

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