



Orbit

The Official Publication of
The Hamilton Centre,

Royal Astronomical Society of Canada

Volume 47, Issue 4: February, 2015

Issue Number 4, February, 2015

Roger Hill, Editor

Wow, that month went really quickly! Of course, since the January meeting was actually on the 8th, it's only three weeks between Orbit's for me.

As I write this, the first NOVA session should have been tonight, but I had to delay it by two weeks due to the lovely dumping of snow we got on February 1st. It does look it will be clear tonight, so when I've done this, I'll go out and clear off the roof of my observatory. I haven't had a chance to do much actual observing recently, so I should really take advantage of the opportunity.

I did get a chance to go out and have a look at Comet Lovejoy, however. It's been a couple of years since PAN-STARRS, so it was nice to have a visible comet, but it would have been even nicer if it had a decent tail. As my friend Charles Baetsen pointed out, it has been a long time since the inarguably great comets of the mid 90's: Hyakutake and Hale-Bopp. Comet Holmes was nice...a lovely large green glow in the late-Fall sky, but no tail. Comet McNaught was probably the last one, but it was the southern hemisphere that got an incredible show.

Anyway, I went out to the observatory on January 9th, hoping to meet a couple of good friends there, but who were unable to make it. As a result, I broke observatory rules in being up there by myself. I brought along my camera, a Manfrotto super-clamp, an extra battery and a few other goodies (like warm boots!). I used the super-clamp to attach my camera and 135mm f/2.8 lens to the Centre's 16", adding in a UHC (UltraHighContrast) clip in filter from Astronomik into the optical path. The observatory computer was put to use controlling both the 16" scope and my camera, and I started taking pictures. It took a few exposures to get an acceptable focus (must work on that) because the lens is an old one, and while it does a good job on the blue and green, stars will end up with a bit of a red halo.

It was a brutally cold night, and the batteries did not last long at all. I did manage to come away with about two dozen pictures. I also took a few of Orion, too, but as the Moon rose, it was time to close up. I deleted the images from the observatory computer and went home.

When I went to process the images on the Saturday morning, I realized that there weren't any in my camera. It took just a few seconds to realize what had happened. The EOS Utility I'd used to control the camera has a setting to either save the pictures to the computer OR the computer and the camera. It must be set to save them to the computer only. So, another trip to the observatory occurred and I restored the images from the Recycle bin, and wrote them to a pair of USB sticks. Oh, and I clicked "Also save on the camera's memory card", too!

I used Deep Sky Stacker to track the comet (I'd never done that before), but no matter what I did, there was only a hint of a tail.

And last week, I had a bit of spare time to use my 6" RC to take some pictures of the Moon. I used an HP Stream 7 (running windows 8, so all my software works on it) and used LiveView to focus. The Stream 7 is compatible with an OTG (On The Go) cable, allowing you to connect a USB hub to it, and consequently, my Canon T1i. The tablet has a 7" screen which makes focussing a lot easier than using the small screen on the back of the camera. It also will take a micro-SDHC card (32gig) and has a 1280x800 screen. It's normally \$120, but can be had for \$100 occasionally. It's a good purchase and will run either Backyard EOS or APT (AstroPhotography Tool). It makes life easier, and at a good price! Highly recommended.

Clear skies and happy observing!

Front page picture is of Venus and Mercury and was taken by Scott Barrie from his driveway in Ariss.

Minor mergers have massive consequences for black holes By Dr. Ethan Siegel

When you think of our sun, the nearest star to our world, you think of an isolated entity, with more than four light years separating it from its next nearest neighbor. But it wasn't always so: billions of years ago, when our sun was first created, it very likely formed in concert with thousands of other stars, when a giant molecular cloud containing perhaps a million times the mass of our solar system collapsed. While the vast majority of stars that the universe forms—some ninety-five percent—are the mass of our sun or smaller, a rare but significant fraction are ultra-massive, containing tens or even hundreds of times the mass our star contains. When these stars run out of fuel in their cores, they explode in a fantastic Type II supernova, where the star's core collapses. In the most massive cases, this forms a black hole.

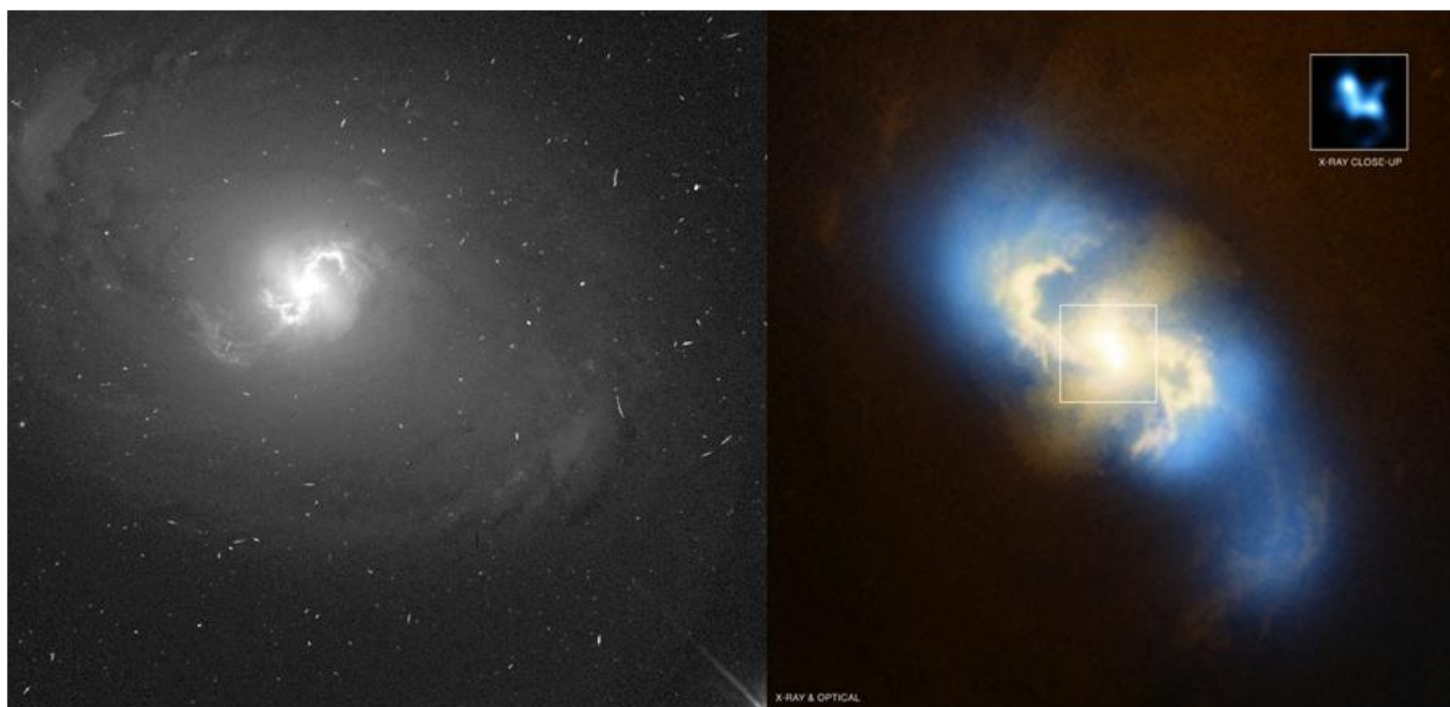
Over time, many generations of stars—and hence, many black holes—form, with the majority eventually migrating towards the centers of their host galaxies and merging together. Our own galaxy, the Milky Way, houses a supermassive black hole that weighs in at about four million solar masses, while our big sister, Andromeda, has one nearly twenty times as massive. But even relatively isolated galaxies didn't simply form from the monolithic collapse of an isolated clump of matter, but by hierarchical mergers of smaller galaxies over tremendous timescales. If galaxies with large amounts of stars all have black holes at their centers, then we should be able to see some fraction of Milky Way-sized galaxies with not just one, but *multiple* supermassive black holes at their center!

It was only in the early 2000s that NASA's Chandra X-ray Observatory was able to find the first binary supermassive black hole in a galaxy, and that was in an ultra-luminous galaxy with a double core. Many other examples were discovered since, but for a decade they were all in ultra-massive, active galaxies. That all changed in 2011, with the discovery of two active, massive black holes at the center of the regular spiral galaxy NGC 3393, a galaxy that must have undergone only minor mergers no less than a billion years ago, where the black hole pair is separated by only 490 light years! It's only in the cores of active, X-ray emitting galaxies that we can detect binary black holes like this. Examples like NGC 3393 and IC 4970 are not only confirming our picture of galaxy growth and formation, but are teaching us that supermassive relics from ancient, minor mergers might persist as standalone entities for longer than we ever thought!

Check out some cool images and artist reconstructions of black holes from Chandra: <http://chandra.harvard.edu/photo/category/blackholes.html>

Kids can learn all about Black Holes from this cool animation at NASA's Space Place: <http://spaceplace.nasa.gov/black-holes>.

Images credit: NGC 3393 in the optical (L) by M. Malkan (UCLA), HST, NASA (L); NGC 3393 in the X-ray and optical (R), composite by NASA / CXC / SAO / G. Fabbiano et al. (X-ray) and NASA/STScI (optical).



Observatory Nights

At the beginning of December, we ran a “Photograph the Moon night” (see the January, 2015 Orbit for a report, and some pictures).

Gary Bennett ran a “New Observatory Users’ Night” on Friday, January 16 (see a report, and pictures, from Troy McCoy later in Orbit) .

Gary Colwell will be offering an evening of Comet Lovejoy observing on Friday, February 20th. Bring a camera capable of long exposures and a tripod to put it on...you just might get your first comet astro-photograph! Bear in mind, though, that astrophotography is NOT the main thrust of the evening. At least, I don’t think it is. Then again, it might be! Come out anyway, because an evening with Gary C, in the dark, in the cold and under a clear sky is always worthwhile.

Lovejoy does not disappoint!

Here’s a couple of pictures. Wayne Herd writes:

Hi everyone, here’s a shot of the comet taken from the parking lot at the observatory tonight (Fri. Jan 17).

While we were getting ready for Gary Bennett’s excellent training session on the observatory equipment, I set up my tripod and banged off a couple of shots of the comet. Conditions weren’t great with cars moving around the parking lot etc. and the focus could be a little tighter, but I got it.

You can see the Pleiades on the left and Comet Lovejoy is the green dot to the right of centre. Canon 5D MkIII, 32mm, 25 sec. at f2.8 ISO 800

Roger Hill took this image, see his comments on Page 2.



Photo's from Members

Gary Colwell went to the Observatory on Friday the 23rd to try to take some pictures of a double shadow transit on Jupiter. He reports: Well as fate would have it I could not get my webcam to work....so I had to use my Canon 60D to take single shots...and the clouds rolled in before I got a chance to take a pic of all three shadows....the Picture I do have is of a double shadow on top of each other of Callisto and Io at 12:50 AM!!!!!!....then it clouded over...%^%\$#@!!! Poor quality images.....but it was beautiful to see visually in the 16".



Scott Barrie writes from Ariss about the picture on the front cover: I drove up the road a mile or two to get a clear western horizon. Venus was easy, but no sign of Mercury. Forgetting to take my binoculars didn't help. Then, looking at the images, it seems Mercury was there all the time. The cold got the better of me and I packed up and went home. Then, after realizing I could easily see both of them from my driveway - and knowing heat was close at hand - I set the tripod up to try again...

Wayne Herd contributed the picture, below, stating: “ Hi everyone, here's a shot I took on Tuesday evening, of Mars, Venus and Mercury. Mars is in the upper left. I got this one from just North of Guelph Lake, a couple of Km from where I live.

1 sec. at f4.0 ISO 400, 42mm at 7:03 pm Tuesday Jan 13, 2015



New Observatory Users Night—Troy McCoy

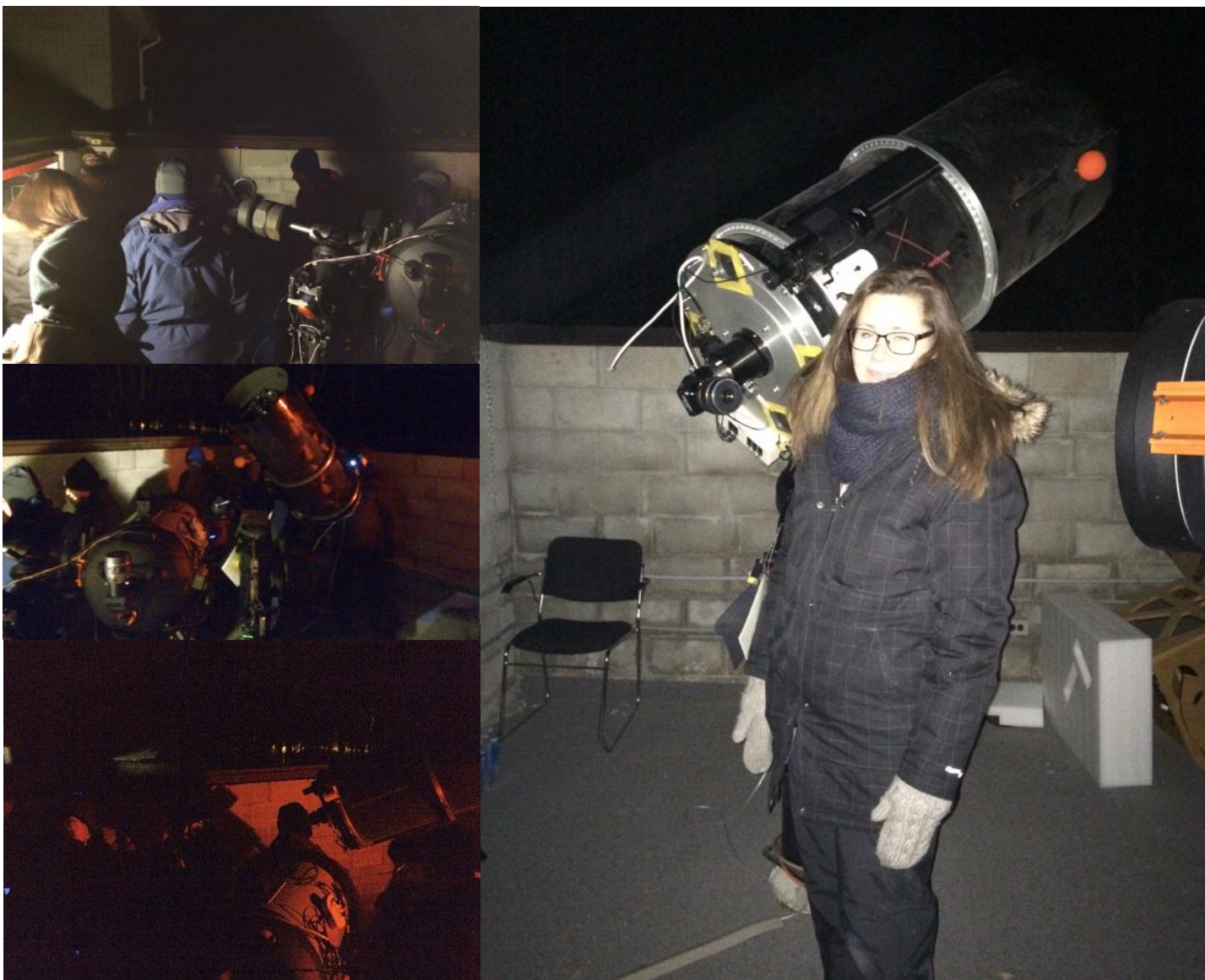
We had a great turn out for Gary B's course last night! Here are a few pictures I took with my phone, if there are any you can use for the next edition of Orbit please feel free to do so. I brought my wife last night so she could see what I have been so excited about the past 2 years since I found the Hamilton RASC. She had a great time and thoroughly enjoyed everyone's knowledge and the friendliness of the group in general.

I have to commend you all for what you have done (and are continuing to do) to bring us "newbie's" into the fold especially as of late. The astrophotography course from Andy at Henry's led me to the NOVA course from Roger (and Mizzi's quizzes :)). Mark's telescope lending program is an awesome way to get people involved and AstroCATS was fantastic! More recently the moon photography night as well as last night's course from Gary B on how to use the observatory are all the reasons people like me have both grown more interested in astronomy and remained with the Hamilton chapter.

These are just some of the great ideas you all have come up with as of late and the attendance at the events has shown others agree. Kudos on a job well done to you all.

I just really wanted to say Thank-you and I look forward to learning more from all of you (even if Ed wants to argue about where Andromeda really is) . Good thing Gary C could tell me where it was. :)

Editor's note: Main picture is of Troy's wife, who is obviously dressed for the conditions. I'd only suggest the use of a toque. Thanks for the kind words, and if there is any type of event or evening you'd be interested in, please don't hesitate to let us know. -RH



Humour:

The following comes from the “e-astronomer”. He writes: Exams are here ! I hear the distant scratching of a thousand pens in echoing sports halls and I know that all is right with the academic world. The future hangs in the balance; careers are won and lost; the [glittering prizes](#) brighten and fade, as inspiration approaches and recedes. But, thanks to Statistics, there are certainties in this contingent world. We just know that most students will do kinda ok; a handful will stun us; and a handful will turn in utter gibberish. Here are some of my favourites, collected from a few years worth of astronomy exams.

Most are from [first year Astronomy courses](#) for a wide range of students – what I believe our American chums call “Astronomy for Poets” or “Scopes for Dopes”. But some are from junior and senior honours students .. see if you can tell which...All real folks.:

- Doppler shift is an effect which doesn't take place on the poles of the earth, but it does everywhere else.
- Black bodies do not emit any light, as they are a box with a tiny hole in. Light enters the hole, bounces around the box, and cannot get out again.
- IR observations tend to be used for trying to find new plants, which at 300K fit neatly in the IR spectrum.
- Physics is terrestrial whereas astronomy is conducted on an astral plane.
- IR astronomy is carried out with an instrument called a bola meter, which is made of geranium.
- Interferometry works because when the dishes are a certain distance apart the radio waves are syncoated.
- We know there is dark matter in galaxies as they rotate faster than they ought to, so dark matter must be absorbing some of the light...
- X-ray astronomy must be carried out from space otherwise the radiation would have a damaging effect on Earth, causing cancer and so on.
- For spiral galaxies, the linewidth technique is known as Tully-Fisher, whereas for elliptical galaxies it is the Fabry Perot method.
- *part of answer to “describe the universe as seen at different wavelengths”.....* The infrared universe is a great deal more colourful, although the colour is often false and generated by a computer.
- Black-body radiation requires dark matter.
- The spectral shape of the radiation from black-bodies is determined by the allocation of nearby bodies, as the gravitational attraction from these can “stretch” the radiation and make it more elliptical.
- The rotation curves of galaxies are the wrong shape. This is because dark matter is concentrated towards the centre, absorbing the light and preventing us from obtaining accurate velocities for this part of the galaxy.
- Astronomy can be seen as applied physics, and indeed most great astronomers have also been great physicians.
- In astronomy, all experiments conducted are out of our control.
- We now know of two black holes, Cygnus I and the one at the centre of the Kerr galaxy.
- A dynamically relaxed system obeys the viral theorem.
- If it weren't for Physics, Astronomy would only be the observation of the pretty bright specs we can see in the sky.
- *Answer to “how would Earth's orbital velocity change if sixteen times closer to the Sun ?”... If the Earth were sixteen times closer to the Sun, it would vaporise and so its orbital velocity would be zero.*
- X-rays from around black holes are produced by accension belts.
- The radio emission from quasars is not blackbody emission because that is a theoretical concept and does not actually exist in the universe.
- White dwarfs are white because they are mostly made of carbon and oxygen i.e. CO, which is a white solid.
- There is no spheroidal component in the Milky Way, as at night we can see that all the stars are in a thin line.
- When forced closer together, the electrons buss about more violently.
- A Type II supernova is the death of a star resulting in a big explosion. This only happens once per star.
- A pulsar is a neutron star that emits ultra-violent radiation.
- The Sun is a main sequence star. This is the most common type of star in the solar system.
- The denser the body the less radiation they emit. The most extreme case being “black body” radiation where no detectable radiation is emitted.
- The mass of the solar system is 10^{30} solar masses. When divided by all the stars we estimate, that comes out at 30 solar masses per star.
- We calculate the distance to the Sun by bouncing radar signals off Venice at six monthly intervals.

.End of An Age by Stuart Atkinson

*Savour these days, relish them,
Roll them around your curious minds
Like the last precious taste of your favourite wine
And sip them slowly, for they will not come again.
At least not in our lifetimes;
These Golden Days are the fading rays
Of our race's First Space Age, for when this year is done
We will finally have seen all Sol's classic worlds,
Walked the planetary path from Mercury to Pluto
To stand on the Kuiper cliff's crumbling edge
And stare out into the abyss beyond,
Knowing there will be nowhere else to go
For The First Time until we punch through the Oort's
Icy wall and push out to the stars themselves.
Even then it will be centuries, perhaps,
Before we see the strange new worlds and moons
Of those other suns; before we marvel at the sight
Of their Atlantics and Everests bathed in alien light.
We have been spoiled of late,
Taken miracles and wonders in our stride.
In my fleeting half century I have seen
Our solar system's greatest secrets revealed –
On Titan, the dried blood stains of foul and fetid lakes;
An impossible Death Star moon skating silently
Around looming Saturn's glittering rings;
Iapetus' Stegosaur spine, slopes airbrushed black and white
By Nature's and Time's patient hands.
Flying by asteroids and satellites
Has become common to us as one amazing place after another
Has been ticked off Mankind's "Must See" vacation list.
So easy now to take for granted the thrill of gazing down
From high above Mercury's poles and spying splashed-comet ice
Glinting far below, or watching the Sun rise behind mighty
Caloris Basin's bulls-eye peaks.
Through SOHO's sentinel eyes we've spied
Countless sublime comets sweeping around the Sun,
Flaring phosphorous bright before fading away,
Their phantoms fleeing into the endless night.
And albatross-winged Rosetta has led me, crunching and crumping
my way
Across the boulder-strewn icy plains of one comet
(With a double-barrelled Russian name I still cannot pronounce)
Before I bounced with Philae over its cratered, pitted face...*

*My greatest joy? An easy choice.
For almost a dozen years I've roamed John Carter's Mars,
Walking proudly beside my beloved Opportunity
As she roved its rusty landscape, standing on craters'
Crumbling edges, crossing deserts of cinnamon sand.
Since her landing, my hand has rested on her back every sol,
As her weary wheels turned and turned and turned,
Churning up the ancient fines,
The Evening Star of Earth burning lantern-bright
In her purple Gothic twilight,
New horizons falling like dominoes as she drove
Across the Red Mars I fell in love with as a child,
Long before Robinson brought its wild and noble lands
So vividly to life for everyone else with his terraforming tales...
All these things I have seen and more*

*But now – The Barren Years loom.
With Chapter One of our restless race's fearful
Walk through space's dark forest almost complete
There is nowhere left to see for the first time,
No magic "What the **** is THAT?" moments lie ahead
To Tweet or blog or post or Google + about.
Instead, an Interlude, adventure put on pause,
Mankind making a cup of tea in the adverts between
Don't Miss episodes of exploration.*

*What next Giant Leap
Will fill our sleep with dreams of greatness?
The first bootprints on Mars you say?
Ha! That is still, as it has always been,
"At least 30 years away".
The first landing on Europa then?
When will Musk, ignoring Monolith Makers' advice,
Melt through that enigmatic moon's Eton Mess ice
To look for life hiding in the slush below?
The first touchdown on Enceladus' snow?
Perhaps... perhaps Chinese cameras will return those
Turner-hued views
Of its geysers' plumes glowing softly in the sky one day...*

*But all an age away, an age,
If they happen at all; if our civilisation does not fall,
Its science smothered beneath blood-soaked black banners,
Its head hacked off and held aloft by ignorance and hate,
Sightless eyes left staring sadly at the stars
It now will never reach...*

*One thing is certain.
In years to come, when Terra's flag unfurls
On worlds whirling around other stars,
When Earth's satellite-saturated sky
Is spattered with points of light
Explorers and colonists call "Home"
They will envy us for living at this time,
Wish that they had been alive
When Voyagers took flight us on their glorious Grand Tour,
When Aldrin was "too busy" to take pictures
Of Armstrong bouncing across the Moon
And twin Vikings landed on Barsroom...*

*How they'll envy our first glimpses
Of Ganymede's frozen coffee plains,
Of Ceres' strange white spot and all the other wonders
We see in our glossy magazines.
Standing on mountain peaks light years away
They'll shake their helmeted heads in disbelief,
Trying to imagine how it felt to soar above Titan's
Hoarfrost-shored lakes with our smartphones,
Wondering how we could sit on juddering buses and planes
Roving fabulous Mars on our tablets without even batting
an eye...*

*So, savour these days, relish them.
For us, they will not come again.*

What you missed last month... words by Roger Hill, pictures by Ed Mizzi

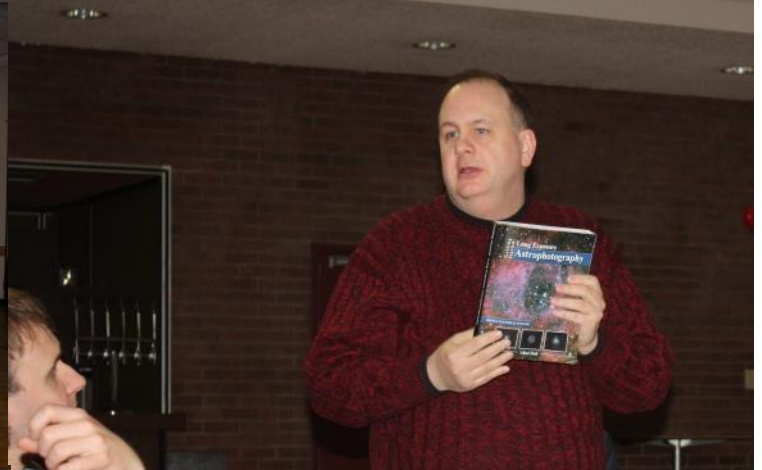
Last month, I wrote that if you missed the December meeting, you missed one of the Great Talks given at the Hamilton Centre. It was a big feather in the cap of Gary Colwell (the President books the speakers) to find such a great speaker.

So what does Gary do? He possibly tops it by booking Dr. Paul Delaney, Professor of Physics and Astronomy at York University. Paul is well known in these parts, having spoken on several occasions. There were quite a few people who turned out, and Paul did not disappoint with "Life on Other Worlds: in Search of Other Earths". His talk was engaging, fascinating, informative and incredibly well presented. Unfortunately, the lively question and answer period afterwards had to be cut short due to travel.



What you missed last month (Cont'd)

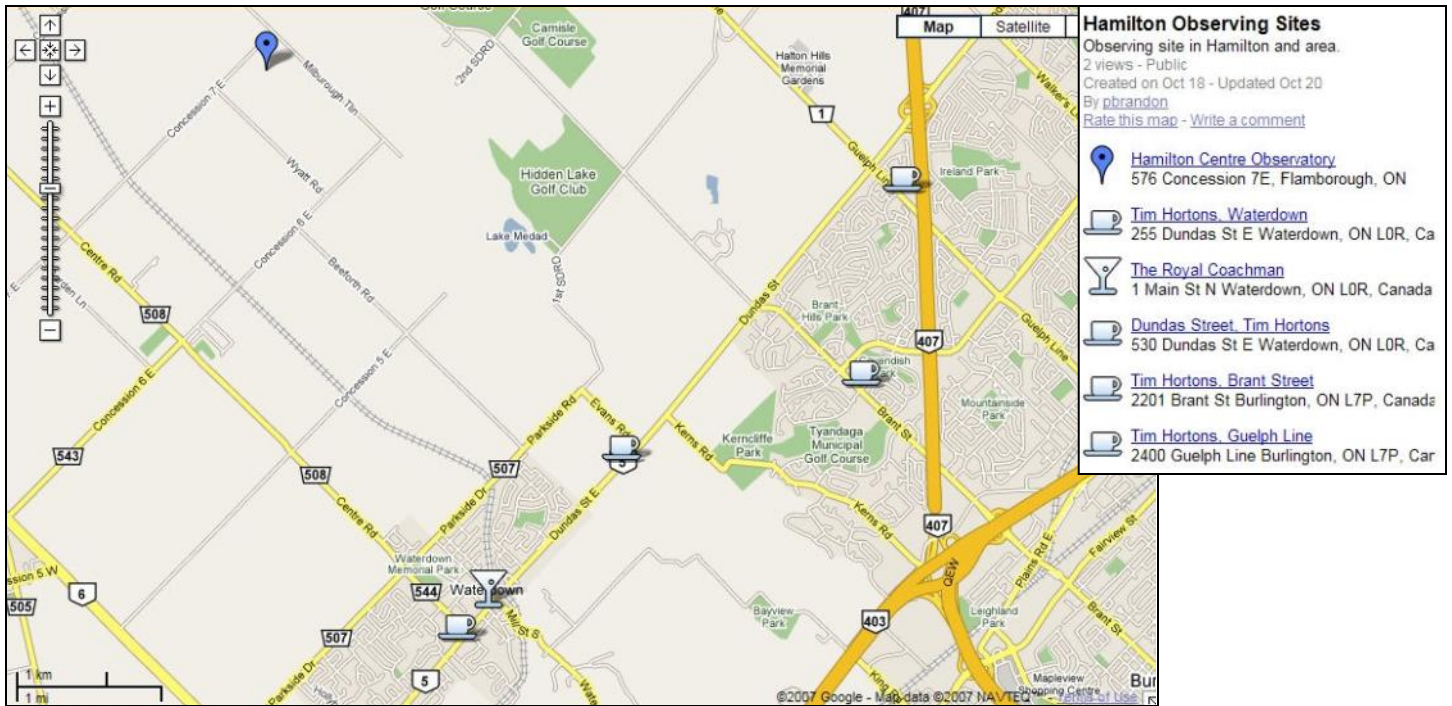
There were other things going on, apart from Paul Delaney's talk, and a visit from the Girl Guides. Gary Bennett showed off the new Mallincams (that's right...plural!), and handed out some welcome packages. Roger Hill solicited people for the next set of NOVA sessions, Colin Haig brought news from National, and Chris Telpas presented a book review of "Long Exposure Astrophotography". Oh, and Gary Colwell told us about "What's in the sky for January, 2015".



Calendar of Events

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
February 1	February 2	February 3 Full Moon: The "Snow Moon"	February 4	February 5 General Meeting in Water-down: Gary Colwell: "Cosmology for Dummies". Moon 6° S of Jupiter	February 6 Jupiter at Opposition	February 7
February 8	February 9	February 10	February 11 Last Quarter	February 12 Board Meeting	February 13 Moon 6° E of Saturn	February 14
February 15	February 16 NOVA Session 1 at the Observatory, 7:30pm	February 17	February 18 New Moon	February 19	February 20 Lovejoy observing at the Observatory Mars 0.75° above Venus, Moon 1.5° to the right	February 21 Crescent Moon occults Uranus. D: 17:48:19 R: 18:45:22
February 22	February 23	February 24 Mercury Greatest Elongation: 27° W, Morning.	February 25 First Quarter Lunar X near Werner	February 26 Lunar Straight Wall	February 27	February 28 Moon occults Lamda Gem D: 19 44 55 R: 21 09 07
March 1	March 2 NOVA Session 2 at the Observatory, 7:30pm	March 3	March 4	March 5 General Meeting in Water-down:	March 6	March 7

Mercury low in the ESE in the morning. **Venus** low in the WSW in evening twilight. **Mars** very low in WSW. **Jupiter** in the East in evening twilight, transits neat midnight, low in WNW at dawn. **Saturn** rises in SE after 3am.



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 Mark Pickett, Vice President and Outreach Director
 Dave Surette, Secretary
 Will Gray, Outreach assistant.
 Chris Telpas, Librarian

This image of the 8-day old Moon was taken by Roger Hill using a 6" RC. A 0.75x MallinCam focal reducer was used, resulting in 935mm of focal length. The camera was an Hα modified Canon T1i. It was processed using Registax 6 and Corel's PaintShop Pro.

