



Orbit

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Roger Hill, Editor

Now THAT was a busy month!

The transit of Mercury was a lot of fun. Some of us had to work, and others did an amazing job of public outreach. I took my 6" Ritchey-Chretien and Personal Solar Telescope with me to work, along with an EQ5 mount, eyepieces, filters, etc. I was able to make it outside for a little while around 9:30am, and sure enough, there was tiny Mercury. The view through the PST was really cool. I had seen a transit of Mercury before, in May 1970, if memory serves, so I had a clue what to expect. Back then I used an old eyepiece to project a view of the Sun onto a white piece of paper, so this was the first time I was able to view the Sun with Mercury on it, with only glass and filters in the way. I have a white light Baader visual filter, too, that I used during the 2012 Venus transit. It was bought from Kendrick, and it works extremely well. The views are tack-sharp, and unlike all the other filters I've ever used (I took a 1000 Oaks 8" glass filter to the Baja Peninsula in 1991), there is no hint that you are NOT getting the sharpest possible view. The cell that it comes with is very well designed, too. Highly recommended.

Four nights later was the 2nd Annual Astronomy Night at Westfield Pioneer Village. Clouds massively interfered with this event, with only the occasional sucker hole allowing people to view the Moon or Jupiter. Prior to the Sun setting, though, I was able to show the Sun through my PST. Afterwards, with the 6" on the mount, some people were able to take a picture of the Moon using their own cell-phones and a couple of iOptron adapters. My son helped out a lot with this: while someone was using one adapter to take a photo, he was attaching the next person's cell-phone to the other adapter. There were not as many people as we had hoped, due to the weather, but those who did come out were very enthusiastic, according to Westfield management. I offered that in future, we should do a private little star party for the non-astronomy volunteers after the park closes. The manager thought that this was a great idea...a number of the volunteers were very interested in what we were doing, and who can resist a look at the Moon through a telescope?

The other event I helped out with was the second Grand Opening of the Rock Garden at the Royal Botanical Gardens on May 24th. The first event was on May 21st, but I could not make it. Eric Golding and Ron Shields were already there by the time I was able to make it, about 7:30. It's been more than a few years since I was there. When I lived in Burlington, the Rock Garden was one of my favourite places to go, and so I was most interested to see what the RBG had done to it. It's a fairly stunning place now, and if you get a chance to check it out, then you should. Astronomically, the evening was a big disappointment. Not only did we have to contend with large amounts of cloud, but the Moon was low in the sky and mostly hidden by trees. I jokingly mentioned to one fellow that a chainsaw is commonly found in the kit of many amateur astronomers, but that we probably wouldn't be allowed to use one in this case. It's a shame that we had to be in that location, though, as there was a fair amount of interest from the RBG patron. Amateur astronomers have frequently been referred to as "Naturalists of the Night", which is probably a more fitting description in this age. For about 15 minutes, the Moon was visible, and a few people who had promised to "come back a little later" were able to see Luna through either Eric Golding's 8" SCT, or the 8" Dob that Ron was looking after.

There will be other RBG events in the coming weeks that we could use a hand with. Sidewalk astronomy is a lot of fun, and we could always use a few more hands!

Clear skies, to one and all!

Roger

Front cover picture by Muhammad Basil Ahmad, who says:

The Transit of Mercury (black dot) as seen through a Celestron 11" EdgeHD telescope fitted with a Baader Solar Filter at approximately 8:35 AM on May 9, 2016 from Burlington, Ontario. This photo was taken with a Canon EOS 40D camera and colour was added in Photoshop. Sunspot Region 2542 (near the top) was a few times the size of the Earth.

Presidents Report – June 2016

May was a busy month for our club with so many different events:

- Luna & Moonlight Events at Royal Botanical Gardens
- Transit of Mercury
- Westfield Star Party
- AstroCATS and CAPS Imaging School
- Some new equipment acquisitions

None of these things can happen without a team of volunteers. There were many, but a few people in particular deserve a special thank you:

Andy Blanchard: With the 4th AstroCATS event now in the record books, Andy has been the driving force behind this important fund raising event since day 1. We don't have a final accounting yet, but I estimate that AstroCATS has raised in excess of \$60,000 to date. Andy is also the driving force behind some rather huge new initiatives that include a partnership with Royal Botanical Gardens as well as a project that will see a world class Planetarium built in our region. Thank you for your tireless efforts Andy!

Ed Mizzi: Ed is reluctant to accept an "official title", but I think it is safe to say that Ed is our Youth Outreach leader. Ed has hosted several events for scouting groups, been a key player in our general observing program at the observatory, and he also organized and hosted our Transit of Mercury event last month.

If you have not yet signed-on to be a volunteer at one of our outreach events, take a moment to talk to Andy and Ed and find out how much fun you are missing.

RASC Awards

The Royal Astronomical Society of Canada bestowed Service Awards on 2 of your fellow members during the GA formal Banquet held in London Ontario, on May 22 . Andy Blanchard and Gary Bennett were awarded Service Awards in recognition of their hard work. This means we now have 5 current members who have won this special award.

New Equipment and Observatory Upgrades – We have the \$'s, now we need volunteers to make it happen

Thanks to the hard work of those who were part of our fundraising efforts, we will be spending some of our funds on some long overdue improvements. We have a very long list and on June 9 the board will be approving projects to get underway. Some of those projects already have funds earmarked, but won't happen unless we have the volunteers to manage those projects. Please come to the June 9 Board Meeting and tell them that you are willing to help out. A short list includes:

- Refurbish the club 16" OGS RC Telescope
- Parking lot – grade and install drainage
- Acquire more Club Loaner Telescopes
- Assorted observatory improvements such as: black-out curtains for OBS computers, eyepiece storage boxes, motion sensor floodlight interrupt timer (keeps the parking lot dark for those setting-up in the parking lot)

Last Meeting until September

We hope you will make a special effort to attend the June 2 meeting. We have a very special speaker who will speak about Gravitational Waves. Given that this once theory has recently become a confirmed fact, this will be a rather interesting topic.

We will also be bringing out some newly acquired equipment to show off at the meeting.

Land of Luna at the RBG By Ed Mizzi

On Saturday, May 14, several club members volunteered to be part of the "Land of Luna – A grand opening celebration for families" event at the Royal Botanical Gardens.

David Galbraith from the RBG had invited us to do some outreach in the form of sidewalk astronomy, so we set up several telescopes just outside of their brand new facility. And in spite of a mostly cloudy evening, we were able to show guests the Moon and Jupiter and received many oohs and aahs from both children and adults alike. We were there from 5:30 p.m. to almost 10:00 p.m. but it was well worth the effort and time.

In attendance were members Gary Bennett, Andy Blanchard, Ron Shields, Eric Golding, Gary Colwell and myself.



NOAA's Joint Polar Satellite System (JPSS) to revolutionize Earth-watching

By Ethan Siegel



If you want to collect data with a variety of instruments over an entire planet as quickly as possible, there are two trade-offs you have to consider: how far away you are from the world in question, and what orientation and direction you choose to orbit it. For a single satellite, the best of all worlds comes from a low-Earth polar orbit, which does all of the following:

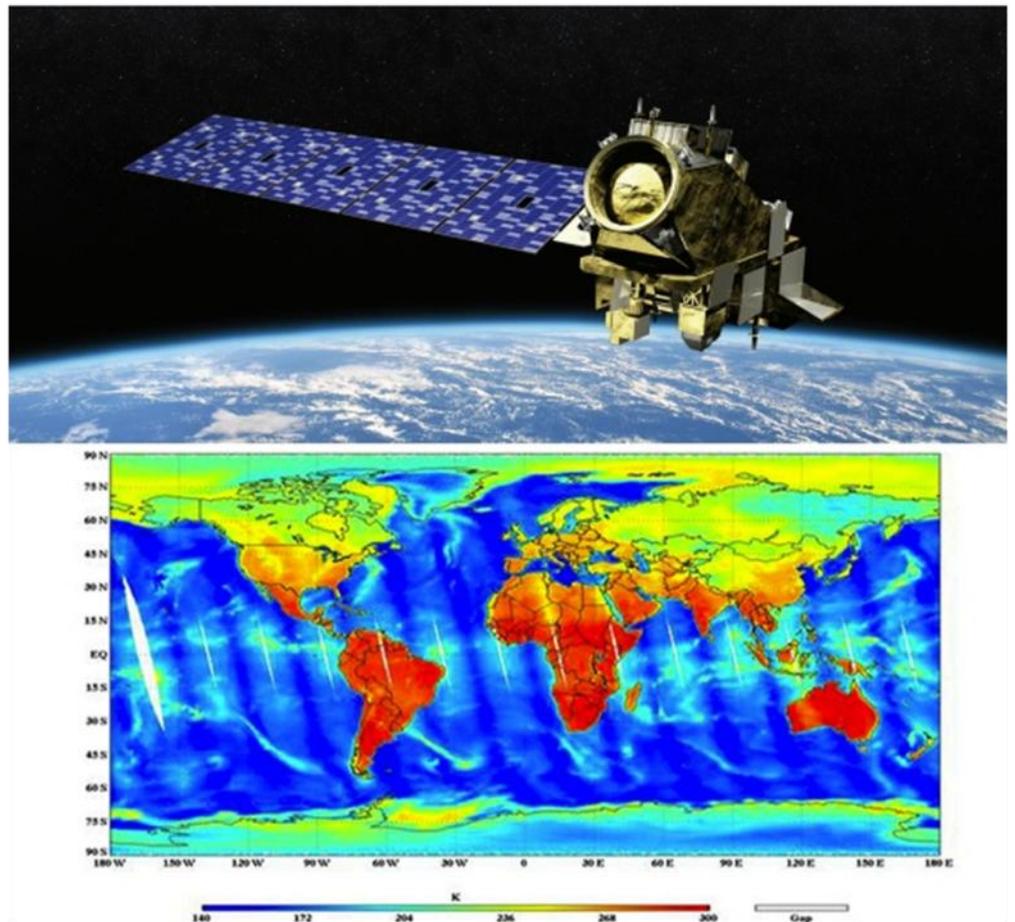
- orbits the Earth very quickly: once every 101 minutes,
- is close enough at 824 km high to take incredibly high-resolution imagery,
- has five separate instruments each probing various weather and climate phenomena,
- and is capable of obtaining full-planet coverage every 12 hours.

The type of data this new satellite – the Joint Polar Satellite System-1 (JPSS-1) -- will take will be essential to extreme weather prediction and in early warning systems, which could have severely mitigated the impact of natural disasters like Hurricane Katrina. Each of the five instruments on board are fundamentally different and complementary to one another. They are:

1. The Cross-track Infrared Sounder (CrIS), which will measure the 3D structure of the atmosphere, water vapor and temperature in over 1,000 infrared spectral channels. This instrument is vital for weather forecasting up to seven days in advance of major weather events.
2. The Advanced Technology Microwave Sounder (ATMS), which assists CrIS by adding 22 microwave channels to improve temperature and moisture readings down to 1 Kelvin accuracy for tropospheric layers.
3. The Visible Infrared Imaging Radiometer Suite (VIIRS) instrument, which takes visible and infrared pictures at a resolution of just 400 meters (1312 feet), enables us to track not just weather patterns but fires, sea temperatures, nighttime light pollution as well as ocean-color observations.
4. The Ozone Mapping and Profiler Suite (OMPS), which measures how the ozone concentration varies with altitude and in time over every location on Earth's surface. This instrument is a vital tool for understanding how effectively ultraviolet light penetrates the atmosphere.
5. Finally, the Clouds and the Earth's Radiant System (CERES) will help understand the effect of clouds on Earth's energy balance, presently one of the largest sources of uncertainty in climate modeling.

The JPSS-1 satellite is a sophisticated weather monitoring tool, and paves the way for its' sister satellites JPSS-2, 3 and 4. It promises to not only provide early and detailed warnings for disasters like hurricanes, volcanoes and storms, but for longer-term effects like droughts and climate changes. Emergency responders, airline pilots, cargo ships, farmers and coastal residents all rely on NOAA and the National Weather Service for informative short-and-long-term data. The JPSS constellation of satellites will extend and enhance our monitoring capabilities far into the future.

Images credit: an artist's concept of the JPSS-2 Satellite for NOAA and NASA by Orbital ATK (top); complete temperature map of the world from NOAA's National Weather Service (bottom).



The Transit of Mercury Outreach Event By Ed Mizzi, and Edited by Jeff Booth

If you witnessed the transit of Mercury on May 9 you know how amazing it was. But if you witnessed the transit along with an entire elementary school body (360 students), you would have been doubly amazed!

The stage was set early in the day when Jeff Booth, Muhammad Ahmad and I arrived at the Burlington school before 7 a.m. Of course, with school not starting until 9 a.m., there were selfish motives at work. We all wanted to witness the start of the transit – the ingress – and we were not disappointed. There was not a cloud in the sky and seeing Mercury begin to cross the surface of the Sun was breathtaking.

Shortly thereafter, Wayne Herd joined us and we finished setting up the club's signs, a display board that I had made, and a projection screen/binoculars setup that could be viewed in case anyone chose not to look through one of the 'scopes.

While we waited for school to begin, Mark Smith and a friend showed up to have a look on their way to work, as well as two of my neighbours, along with their children. Like many other amateur astronomers, I am the go-to astronomer in my neighbourhood and I just love it when they take me up on offers to view objects in the sky.

The first class came out at about 9:15 a.m. and we began our sessions with a short explanation of what was occurring, using my Bristol board diagram, and a basketball and golf ball (obviously not relative in size). Then Wayne explained how the binoculars/white screen was the safest way to view the event and that gave him a chance to discuss the importance of viewing the Sun properly and safely. It just so happened (fortuitously) that when we set up the binoculars Wayne covered one of the eyepieces with a disc of cardboard and by the time we remembered to cover the objective end, the Sun had burned a hole through the cardboard. This made for a very helpful and telltale prop when explaining the danger of looking at the Sun unprotected. We then lined up the kids as we had four scopes to work with and the oohs and aahhs began immediately; and if you have ever done any Outreach work you know just how gratifying and exciting it is to hear people – especially children – using expletives when looking through a telescope.

From then on, until 1:30 p.m., class after class came out for their lesson and views of this amazing event. The energy in the air was almost palpable and the interest by the kids was more than we could ever have imagined. During recesses and lunch we had steady line ups, mostly of children who wanted a second or third look and we could hardly keep up. A few children even asked Jeff if they could let their stuffed animals have a peak. "Of course," came the reply, to squeals of delight.

Ron Shields showed up later in the morning with his telescope, meaning that we then had five 'scopes plus the binocular projection with which to work and several children wanted to look through every scope, even though, for all intents and purposes, the views were almost identical. However, Ron got some extra attention since he had a glass filter that gave slightly clearer views and added some colour to the Sun.

The principal of Canadian Martyrs Catholic Elementary School, Jennifer Yust, came out for a look herself and applauded and thanked us for sharing this with her students and staff. And, of course, thanks to her, too, for hosting us.

We also had some help from Gladwin Hui and Dilip Mahto who showed up later in the day, as well as friends of Muhammad, Mohamed Ramadan and his wife, who brought us coffee, cookies and Timbits...thank you!

The last group to visit us was the junior and senior kindergarten class and, even though some of them had difficulty seeing Mercury, they were still excited to be included in this special event, as was their teacher who, believe or not, I taught years ago in high school (poor girl). After the kids were gone, four of us decided to stay to the end. Being as "geekish" about astronomy as we are, we just had to see the egress, too. So there we were, Jeff, Ron, Muhammad and this writer waiting patiently for that special moment, where Mercury would depart the disc of the Sun. Both Jeff and Muhammad had cameras set up to record the event and of course, clouds began to roll in. So between cloud cover and clear skies, we did get glimpses of that moment, some of which were posted on the Hamilton Centre Forum and we all agreed that this was a day to remember.

A special thank you goes out to Gary Bennett who had two solar filters made up for two of the club's eight-inch Dobsonian telescopes and gave us the moral support we needed to succeed. The high reflectivity of the solar filters was not lost on two young ladies, in a senior grade, by the way, who independently discovered the filters can also be used temporarily as rather good check-your-face mirrors.

Thanks, as well, to Boris Hofman, a long-time colleague and the school board's media expert, for coming out to take photos and video of the event.

And last but far from least, a very special thank you goes to the teacher who was my contact at the school and who made up school announcements, produced a schedule of classes for the day and generally got the entire school excited about this event. Thank you Claudia Amendola.

Photos of Transit by Jeff Booth (#1 & 2), Muhammad Ahmad (4) and Mohamed Ramadan (3)

Photos of event by Ed Mizzi, Boris Hofman, Jeff Booth and Mohamed Ramadan





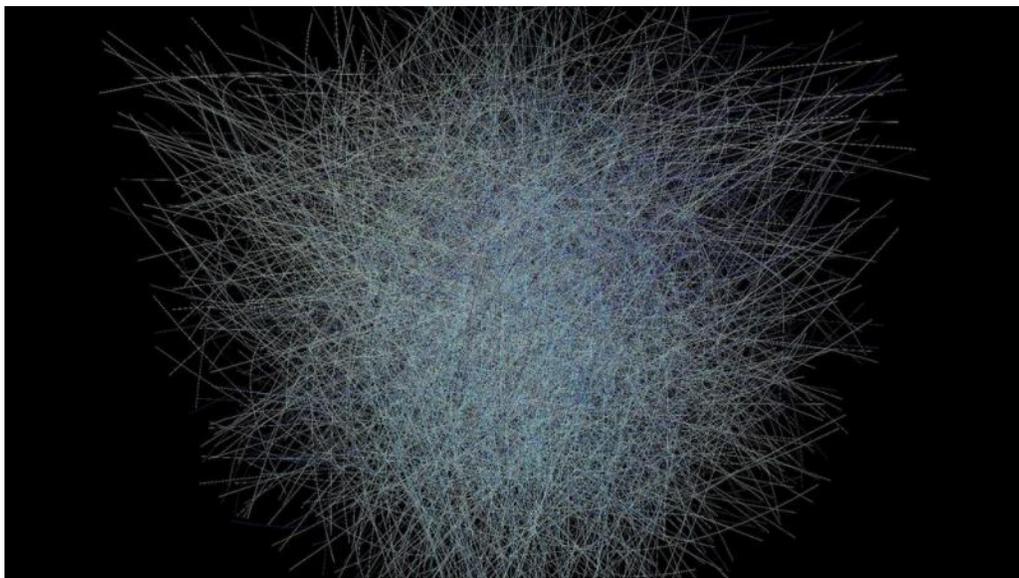
Gravitational Waves Could Finally Help Us Prove String Theory by Allison Eck

Einstein desperately wanted a unified theory of physics. Thanks to gravitational waves—the poster child of general relativity—his wish might just come true.

Gravitational waves are ripples in the fabric of space-time that reverberate from the source of a gravitational disturbance. Einstein had predicted gravitational waves as part of his general theory of relativity, but scientists confirmed their existence just this past February. Gravitational waves behave like electromagnetic waves except that the latter travel in spacetime; the former, however, is an actual disruption in spacetime itself.

String theory, meanwhile, says that if you zoom in on an elementary particle, you'll see a vibrating string of energy. It's a theory that cosmologists have been holding onto for a while, since it promises to thread the needle between two seemingly contradictory ideas in physics. Unfortunately, our current technology doesn't allow us to observe strings directly—we'd need much more powerful colliders for that.

But in a paper published May 12 on the arXiv, a group of scientists has claimed that we can use gravitational waves—and the way they scatter throughout space—to detect cosmic strings once and for all. Since cosmic strings act as tiny bundles of spacetime, they're strong enough to thwart a gravitational wave's path, and send it scattering in a different direction. That diffraction pattern could reveal cosmic strings.



An artist's depiction of superstrings

Here's Chris Lee, writing for ArsTechnica:

They pictured a string as a sharp crease in space-time and calculated the propagation of a gravitational wave through the crease. They showed that the wave pattern far away from the defect looks exactly the same as you would observe from a light beam that scattered off a thin wire. This meant that the researchers could use all the tools of classical optics to calculate what the spatial patterns of the gravitational waves would look like and how these patterns would spread out in space and time.

From our point of view, what we would see is a characteristic intensity pattern of gravitational waves. Essentially, the waves that passed to the left and the right of the string are bent so that they pass through each other and interfere. This results in strong gravitational waves propagating off at some angles and no gravitational waves at other angles. By measuring this pattern, we would learn a lot about strings. And, indeed, to observe such a pattern would be a fairly good indication that there might be such a thing as a cosmic string.

Astrophysicists are going to have to be pretty lucky to capture this kind of data. We can only see gravitational waves by observing massive but short-lived events; on top of that, we'd need a specific type of string to accomplish this feat. But it's not like we haven't been incredibly lucky in the past—it could happen again.

May 2016 Meeting Synopsis

By Ed Mizzi

The May meeting was another “Blockbuster” event, with several special announcements and two, yes, TWO guest speakers!

Gary Bennett welcomed everyone, presented a breakdown of the meeting agenda and then introduced Bob Prociuk. Bob is in charge of memberships and indicated that our numbers are very healthy and stable.

Andy Blanchard was next. He spoke about CAPS (Canadian Astrophotography School) taking place alongside AstroCATS and the National GA. He was excited to inform us about the special teachers who will be sharing their wealth of knowledge and skills with students of all levels. He also talked about AstroCATS and that enough volunteers had come forward to help out for both days.

Ed Mizzi announced an Outreach event that would take place on May 9. He had arranged with a teacher, Claudia Amendola, at a local elementary school, Canadian Martyrs in Burlington to show the student body the Transit of Mercury.

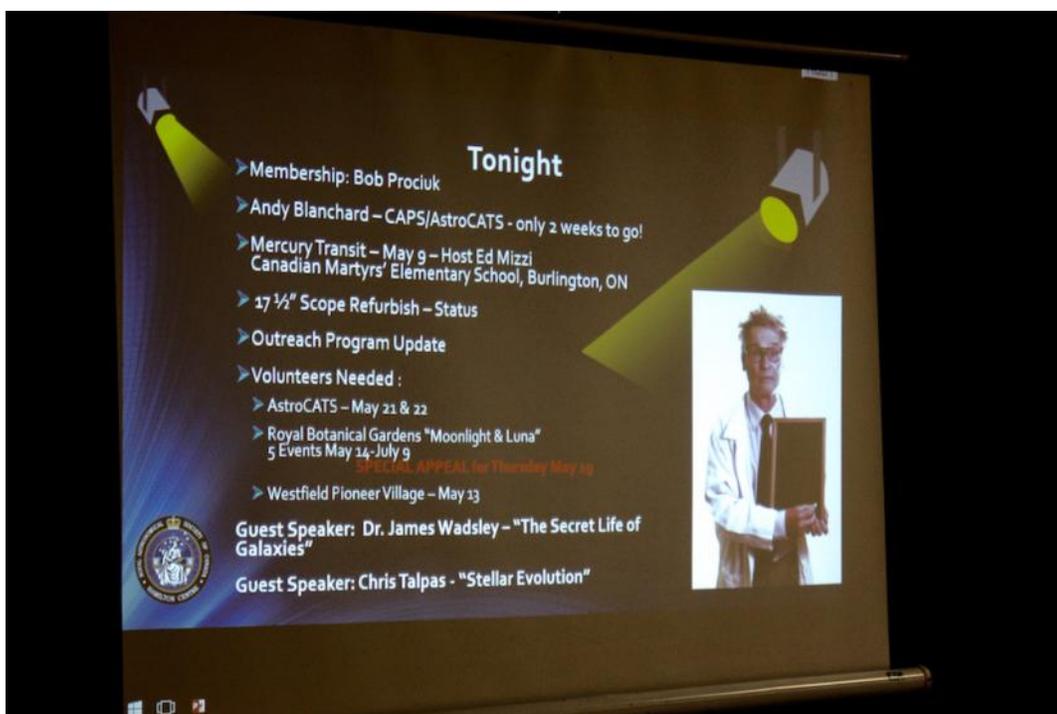
Gary Bennett spoke briefly about the ongoing work on refurbishing the club’s 17.5 inch telescope.

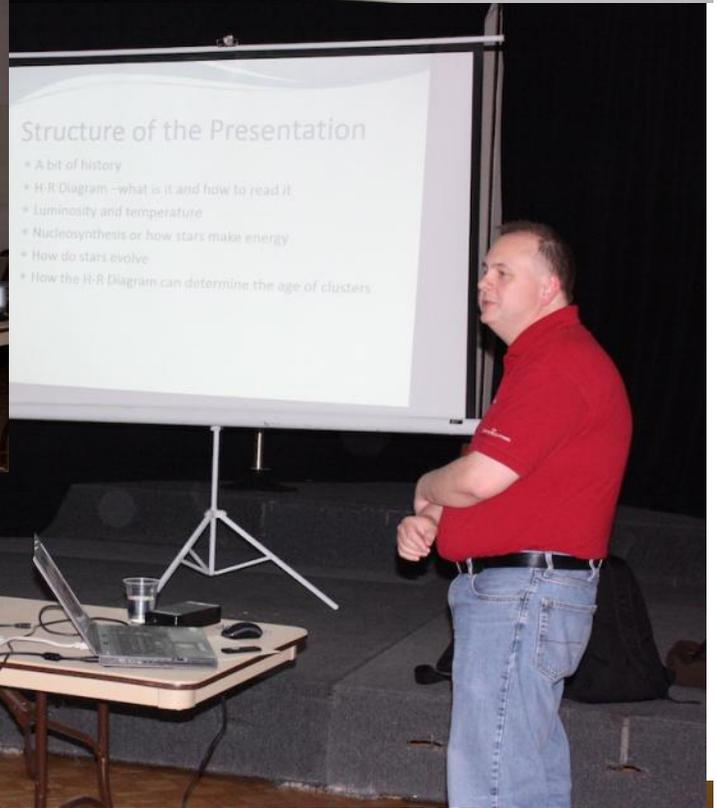
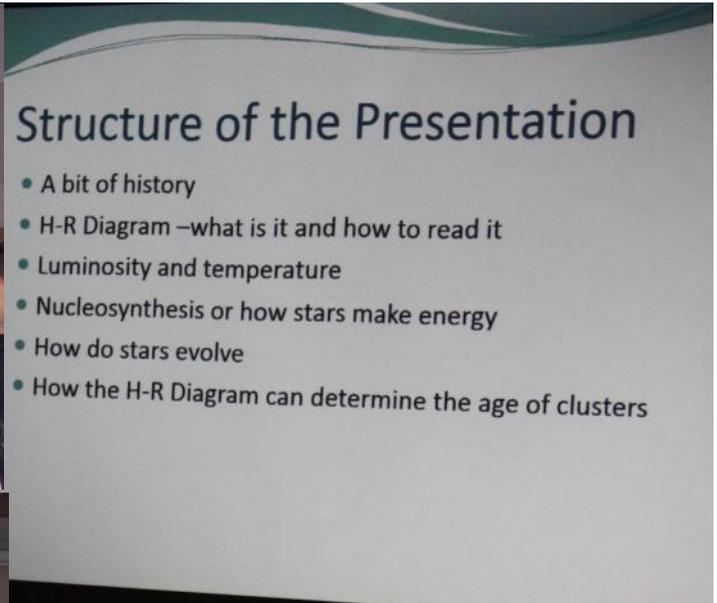
Gary Bennett talked about our new partnership with the Royal Botanical Gardens (RBG) and asked for volunteers to help with their grand opening events over the next 2 weeks. In addition, he mentioned our Outreach event at the Westfield Heritage Village where we would be a major player in their Star Party on May 13.

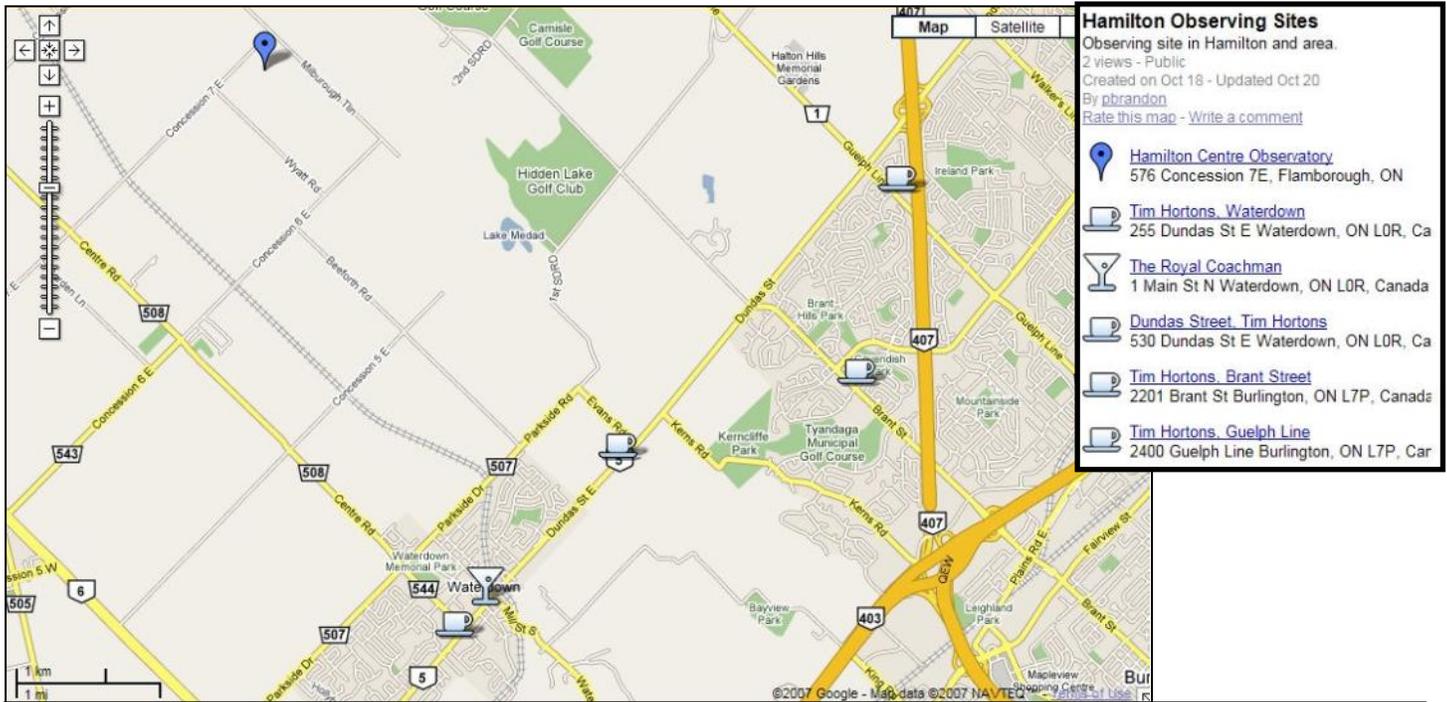
We were then treated to a talk about “The Secret Life of Galaxies” by Dr. James Wadsley from McMaster University. His talk was both informative and enlightening and he gave us a new and better understanding of the life cycle of galaxies and dark matter. Very intriguing and eye-opening.

Our second speaker, Board/Club member Chris Talpas, spoke about “Stellar Evolution” and once again, we were educated on a topic that interests all astronomers, both amateur and professional. His talk dove-tailed very well with Dr. Wadsley’s and by the end of the evening audience members walked away with a plethora of knowledge that would move us along in our understanding of the cosmos.

We look forward to our last meeting of the year, on Thursday, June 2, when we will here from Physicist Cliff Burgess about Gravitational Waves, a topic that has recently gone viral in the astronomy world.







Observatory Location:

576 Concession 7 East,
 Flamborough ON
 N43° 23' 27" W79° 55' 20"

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|----------------------|------------------|
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3 bright planets are found in the night sky of June. Jupiter shines in the southwest, while Mars gleams in the southeast. Saturn rises moderately far behind Mars.

Dependably bright **Jupiter** sets at midnight by month's end .

Just passed opposition, and still relatively close to Earth the still blazingly bright **Mars** is highest in the south few hours after sunset.

Golden **Saturn**, east of Mars is at opposition in early June and is visible from Dusk to Dawn for much in the month.

Mercury can be glimpsed very low in the east-northeast at

Calendar for May, 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2 Events: 8pm - General meeting at the Waterdown Legion	3	4 New Moon
5 - Week 23	6	7	8	9 Events: Board Meeting at the Observatory, 8pm	10	11
12 - Week 24 First Quarter	13	14	15	16	17	18
19 - Week 25	20 Summer Solstice, Full Moon	21	22	23	24	25
26 - Week 26	27 Last Quarter	28	29 Events: Astrophotography at the Observatory	30		