Orbit

The Official Publication of
The Hamilton Centre,
Royal Astronomical Society of Canada

Volume 47, Issue 7: May, 2015

Issue Number 7, May, 2015
Roger Hill, Editor

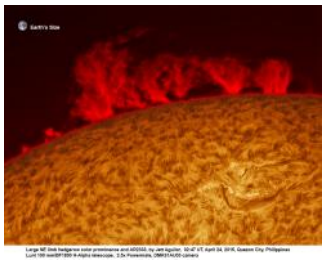
Now THAT was fun! The star party at Westfield was a really good time, and if you weren't there, you missed a great evening.

In times past I've had to disappear into the bowels of the office and choose some apparel that would be in character for a citizen scientist of the late 19th Century.

Not this time, though. 21st Century technology was allowed! My work schedule, sometimes a real pain, was actually beneficial, as I had the Friday and Saturday off. This meant that I was able to find a 6-volt sealed lead-acid battery to run my mount, gather everything together, test it all to make sure that it was all working, pack it in the truck and make it to Westfield before anybody else but Mark Pickett! Oh...and some people from the McMaster University Sidewalk Astronomers.

The only thing that I was really worried about was, since I could not leave my vehicle on the village common, how would I protect my equipment? Fortunately, though, I have an old car-top carrier I bought many years ago in Florida.

You see, I had planned to take two telescopes with me. Since the Sun would set about 8:15, I took my Coronado PST (Personal Solar Telescope) with me, to allow people to see the Sun in a way they'd never seen it before.



When I set it up, I was astonished to see that the Sun had a brush-like prominence. I don't often look at the Sun, but I'd never seen anything like this before. There were lots of people who dropped by to take a look at the Sun in Hα, and they were awed by what they saw.

After the sun disappeared behind some distant trees, I swapped out the PST, and put my Astro-tech 6" Ritchey-Chretien on in. It took a bit of time before it got really dark so I was able to carefully focus my iPhone on the Moon using one of the Centre's iOptron adapters.

They work very well, but by this time the battery I had was not sufficient to power my mount. In the next hour and a half, I'd estimate somewhere between 40 and 50 people used their smartphones to take a movie of the Moon as it drifted across the field of view of their phone. It turned out to be an incredibly popular thing. I could have used an assistant to get the phones ready with one adapter while someone else was taking a movie of the Moon. Maybe next time I'll convince my son to come along with me.

The other event in April was the total lunar eclipse on April 4th. Of course, it wasn't total in this area; totality occurring well after the Moon had set.

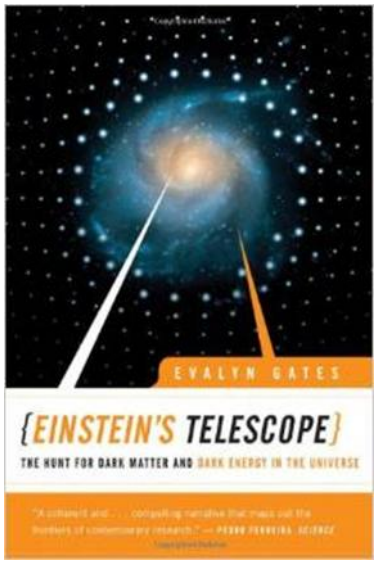
Just north of the Observatory, on Milburough Town Line, there is a good view towards the western horizon, and that is where the impending dawn found me. Again, I used my 6" RC, but this time Murphy's gremlins struck...the wires to the electric focuser broke, rendering the focuser next to useless. All I could do was to loosen the two screws on the bottom, allowing the focuser tube to slip. I did my best, but I could not achieve a good focus. A small Allen key that will allow the focuser to be used manually is now part of the kit I take with me! Still...I'd rather discover this now than in September when we'll see a Lunar Eclipse from start to finish!

You live and learn!

Roger

Westfield Pioneer Village Star Party—Pictures from Ed Mizzi

Librarian's Report for May 2015 by Chris Talpas



Our concept of the make-up of the Universe has been fundamentally shaken up by the discovery in the late 1990's that not only is the rate of expansion of the Universe not slowing down, it is actually speeding up! This unknown force has been dubbed Dark Energy and this month's book introduces the reader to this strange new world.

"Einstein's Telescope: The Hunt for Dark Matter and Dark Energy in the Universe" by Evalyn Gates

At 288 pages [14.2 x 21.1 x 2 cm] it gives a solid introduction to the topic. While it is certainly a daunting topic, Gates is able to gently lead the reader in an engaging, almost conversational manner. As she states in her preface "No prior knowledge of science of any kind is assumed." While simplified, the book is not simplistic and concepts do sometimes require some rumination before they become clear, but the effort is well worth it.

Chapter 1 begins with "What is the Universe Made Of?" and over its 29 pages sets the stage for our drastically altered view of the Universe where the matter that we are all familiar with - protons, neutrons, electrons and the atoms and molecules that they make up - only accounts for 4% of the 'stuff' of the Universe. She describes the "Standard Model" of Particle Physics with its quarks, neutrinos and leptons and how these subatomic particles join together to make up the matter we are familiar with. Next she turns to the Big Bang and gives a brief history of the Universe and introduces the concepts of Dark Matter and Dark Energy. She also stresses that our understanding of the unimaginably large (General Relativity) and the incredibly small (Quantum Mechanics) are essential for our determining the composition of the Universe.

Chapter 2, "A Revolution in Space and Time" discusses Einstein's theory of General Relativity with its concept of space-time which was able to account for non-Newtonian behaviour of Mercury's orbit and prediction that massive objects can warp space and cause light to bend. Special Relativity and the nature of time are also covered as is the "Equivalence Principle" as it applies to gravity.

In Chapter 3, "A Cosmic Expansion", Gates starts with Einstein's Equation which relates space-time curvature with the distribution of matter and energy within it and then discusses curvature of space and how the shortest distance is not a straight line using the analogy of an aircraft's flight path from North America to Europe when projected onto a flat map is a curve. Next, she covers how space-time actually moves in terms of expansion. Objects are moving away from us because the space between them and us is actually expanding. Finally the roles of radiation, matter, and dark energy in controlling the Universe are discussed.

Chapter 4, "Einstein's Telescope", which describes the bending of light by a massive object, begins by recounting the 1919 Eddington eclipse expedition that provided experimental proof of Einstein's theory by showing the gravitational lensing of the Sun when viewing the Hyades star cluster. Next the use of this technique to detect gravitational lensing by galaxies, as predicted by Zwicky, is discussed along with the concept of an "Einstein Ring" which is the consequence of lensing when the light source, lens, and observer all line up perfectly. These lenses then allow one to back calculate the mass of the object causing the lens to form.

Chapter 5, "MACHOs and WIMPs" discusses the observation that as one moves out from the center of galaxies, the stars and star clusters are orbiting much faster than predicted based upon the visible matter present and galaxies have a large dark mater halo around them. MACHOs (MAssive Compact Halo Objects) are faint objects made of normal matter such as white and brown dwarfs, black holes and planets while WIMPs (Weakly Interacting Massive Particle) are a leading candidate for cold dark matter. The search efforts for MACHOs is also discussed.

Chapter 6 "Black Holes and Planets" as the title implies discusses Black Holes, the collapsed remnants of massive stars, and the mass contribution from planets. As she does throughout the book, Gates tells of the people and history behind the concept describing Schwarzschild's (famous for calculating the radius of a black hole) formulation of the equations during his service in World War One on the Russian front. Some of the search efforts for extrasolar planets is described including using microlensing of the star.

Chapter 7, "Weighing the Universe" describes using Gravitational lensing to measure the mass of galaxies and galaxy clusters. A number of examples are discussed along with the importance of the orbiting observatories like Hubble and Chandra.

Chapter 8, "Cold Dark Matter" discusses how dark matter dominates the mass of the Universe but that the nature of this new form of matter is unknown even though it makes up ~ 85% of the mass of the Universe. WIMPs, a leading candidate for dark matter are discussed in detail in this chapter. An alternative model of Gravity called MOND is described as another possibility to the existence of Dark Matter.

Chapter 9, "Tracing the Invisible- and Finding Dark Matter" focuses on dark matter halos around galaxies and how observations are being used to test the latest theories. The role of gravitational lensing, both strong and weak, in this search is described. Its effect on individual galaxies as well as clusters of galaxies is discussed.

Chapter 10, "An Accelerating Universe" discusses the even more mysterious Dark Energy, described as the most compelling mystery in physics today. The discovery of this force was made by two teams trying to measure the rate of expansion of the Universe at different points in its history by looking at type 1a supernovae. Much like Edwin Hubble used Cepheid variables to measure the distance of nearby galaxies, Saul Perlmutter and Brian Schmidt independently used type 1a supernovae to measure the distances of much more distant galaxies. Much to their surprise they found the rate of expansion increasing! Some of the theories on what Dark Energy is, are presented as well in this chapter.

Chapter 11, "The Imprint of Dark Energy on the Cosmic Web" discusses four general methods of tracking down the effects of dark energy on the Universe: Searching for Distant Supernovae, Mapping the Distribution of Galaxies, Surveying Clusters, and Gravitational Lensing. Both current and near future search efforts are also described in this chapter including the Square Kilometer Array radio telescope.

Chapter 12, "Gravity Waves" begins by discussing the problem of the uniformity of the cosmic background temperature of 2.725 K (although small variations do exist) and the inability of the Big Bang Theory to explain this smoothness. Inflation, a set of models predicting the exponential expansion of the Universe, may be the key to understanding the "smoothness" problem. The observational support for the existence of Gravity Waves in a pair of neutron stars is described -resulting in a 1993 Nobel prize.

Chapter 13, "Dark Matter and Dark Energy: Keys to the Next Revolution" provides a very short recap and some closing statements about the exciting discoveries that lay ahead.

While this book certainly discusses some meaty topics, the author faithfully avoids losing the reader with overly technical jargon. While this book certainly isn't a light read, it is quite readable and will help to illuminate the new and emerging fields of dark matter and dark energy. It can be ordered from Amazon.ca for $25.72 for the hardcover or $21 for the paperback.

A Great Publication by a Dedicated and Kind Amateur Astrophotographer by Ed Mizzi

Earlier this year, Chris Talpas, our Hamilton Centre Librarian, did an excellent review of a book titled "Getting Started: Long Exposure Astrophotography" by Allan Hall. I borrowed the book for a short while and was so impressed that I ordered a copy on-line.

I read through most of the text and realized that there was an order form included, for a DVD, which included Bonus Material related to Allan's book. It was only 15USD, so I sent a money order to Texas. While I realize that items coming from the USA sometimes get stalled at the border, I decided, after several weeks to send Mr. Hall an email. He responded immediately and was very surprised that I had not yet received the DVD. So he offered to send out a second copy, at his expense, even though I offered to split the cost with him.

He sent it Express Post this time, and it arrived in a timely fashion. However, when I opened the unusually heavy parcel, I felt as if Christmas had come early. Not only did he include the DVD but he sent another of his books (gratis), titled "Messier Astrophotography: Reference".

And what a great reference book it is! After reading through it, I contacted Chris to see if he wanted to do a review of this new book. He told me he was already preparing a review of a different publication for May and that, if I agreed, I could do a short presentation after his, at our May meeting. I am including a short review with this article, but before I do I want to give huge kudos to Allan Hall from Texas. Not only does he write books that are extremely useful and easy to read (for both beginners and experienced amateur astronomers), he is an honourable person who cares about his customers. And when you read his publications you will get a sense that he truly loves astronomy and astrophotography and is not in this for the money.

On to this Reference Guide.

Following a Table of Contents and short introduction, the next section describes "Using this book" which tells the reader the format used for each Messier object, from when it is visible from the Central USA to its size in 3 different scopes (using a 25mm eyepiece for reference).

Next comes a two page section called "Charles Messier and his list".

The next 329 pages include 3-page descriptions of objects from M1 to M110.

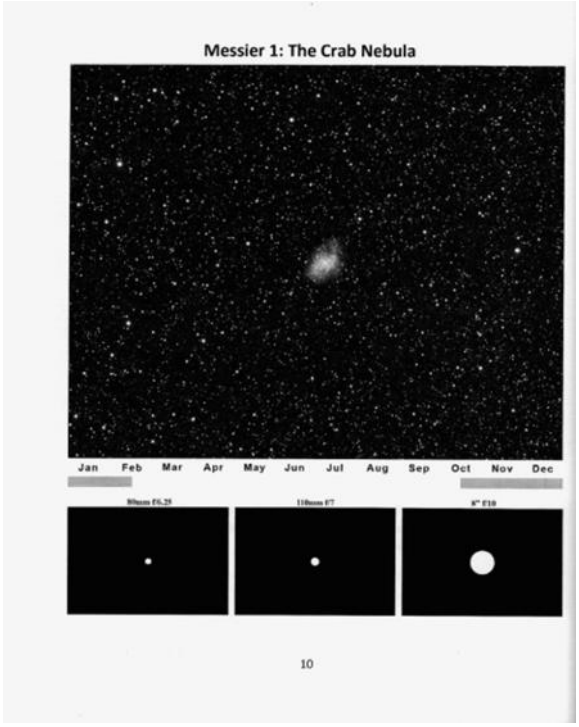
Each object section includes the following:

Page 1: B & W image, when it is visible (months), its size in all 3 scopes (see 1. Above)

Page 2: "About the target"; "Where it is"; "Imaging the target"

Page 3: A Sky Chart showing the position of the target in the sky

At the end of the book is a one page chart showing the best month to image particular Messier objects.



As a "learning" astrophotographer myself, I found his 3-page setup extremely helpful. For one, I could see what the object looks like and the approximate size it would be in my particular scope. Second, Allan gives very helpful and useful information about the object itself and tips on imaging it. And finally, the sky charts he provides give accurate placement information, making it easy to find objects in the sky, useful for both observing and imaging.

To conclude, Allan Hall states that he wrote this reference guide for beginning astrophotographers, but I believe that it would be useful to anyone doing astrophotography, especially those who want to take on the challenge of finding, observing and possibly imaging all 110 Messier objects.

Allan's website is at http://www.allans-stuff.com/

From members…

In the calendar for April, there was an entry for the Lunar, or Werner, X. As the date approached, I sent out an email reminder, and included a finder chart. The night was cool and clear. Ed Mizzi was sufficiently intrigued to take a picture of the Moon from Waterdown at 01:04:38, April 26, using his Canon xSi DSLR and an 8" Dob (F=1200mm), at 1/160 and ISO 800.

Little did Ed know, but he'd also caught the Lunar V! The Lunar V is somewhat less known and is a sunlit feature similar to the X in size, but is visible for quite a bit longer after the "X" has dissolved into the background craters. Created by sunlight striking the tops of the crater Ukert and ridges nearby, the "V" shape is quite a bit further north, just south of Mare Vaporum. As the "X" becomes less prominent over time, the "V" still maintains a distinct shape and can be viewed with most any small telescope or tripod-mounted binoculars.


1

Chris Talpas sent along a pair of photos. Image 2 is of M31 and he took it last August at Tobermory using a Canon EOS 450 (XSi) with a 55-250 mm lens @ 150 mm f5 17 x 180s exposures stacked piggy backed on 10" SCT on a NEQ6 unguided. Photos with dark and flats were stacked in DSS and then processed in Star Tools.

Image 3 M27, the Dumbell Nebula and was taken from his balcony in Milton with a 10" SCT @ f6.3 on a NEQ6 unguided with a Canon EOS450. A total of 57 x 35s exposures were stacked in DSS and then processed in Star Tools.

Chris used Backyard EOS to control the camera for both images.


2


3

4

April 4, 2015 saw a partial Lunar Eclipse in the pre-dawn sky.
The picture to the right was taken by Ed Mizzi. He took it from his home in Waterdown. The camera was a Canon XSi DSLR, f5.6, 1/320, 1600 ISO, through a double pain (sic) window, at 6:41 AM.

The remainder were taken by Roger Hill from just north of the Observatory

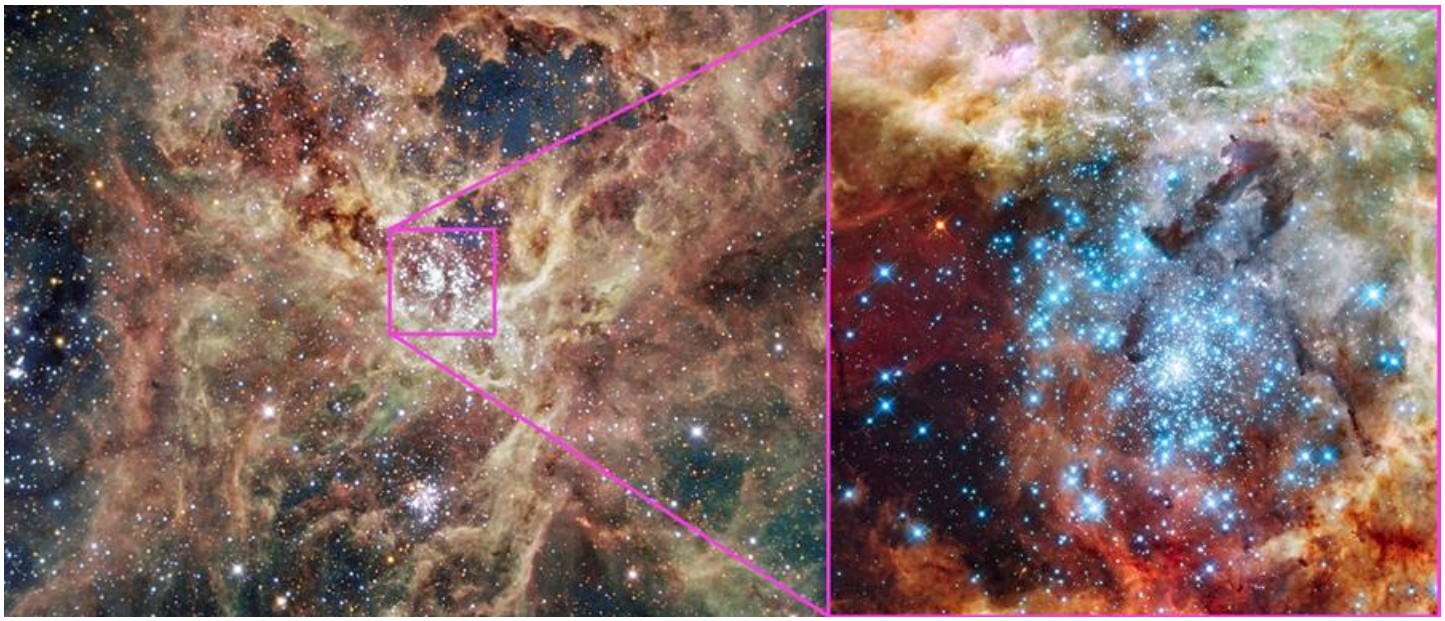
.Is the Most Massive Star Still Alive? By Ethan Siegel

The brilliant specks of light twinkling in the night sky, with more and more visible under darker skies and with larger telescope apertures, each have their own story to tell. In general, a star's color correlates very well with its mass and its total lifetime, with the bluest stars representing the hottest, most massive and *shortest-lived* stars in the universe. Even though they contain the most fuel overall, their cores achieve incredibly high temperatures, meaning they burn through their fuel the fastest, in only a few million years instead of roughly ten billion like our sun.

Because of this, it's only the youngest of all star clusters that contain the hottest, bluest stars, and so if we want to find the most massive stars in the universe, we have to look to the largest regions of space that are actively forming them right now. In our local group of galaxies, that region doesn't belong to the giants, the Milky Way or Andromeda, but to the Large Magellanic Cloud (LMC), a small, satellite galaxy (and fourth-largest in the local group) located 170,000 light years distant.

Despite containing only one percent of the mass of our galaxy, the LMC contains the Tarantula Nebula (30 Doradus), a star-forming nebula approximately 1,000 light years in size, or roughly seven percent of the galaxy itself. You'll have to be south of the Tropic of Cancer to observe it, but if you can locate it, its center contains the super star cluster NGC 2070, holding more than 500,000 unique stars, including many hundreds of spectacular, bright blue ones. With a maximum age of two million years, the stars in this cluster are some of the youngest and most massive ever found.

At the center of NGC 2070 is a very compact concentration of stars known as R136, which is responsible for most of the light illuminating the entire Tarantula Nebula. Consisting of no less than 72 O-class and Wolf-Rayet stars within just 20 arc seconds of one another, the most massive is R136a1, with 260 times the sun's mass and a luminosity that outshines us by a factor of *seven million*. Since the light has to travel 170,000 light years to reach us, it's quite possible that this star has already died in a spectacular supernova, and might not even exist any longer! The next time you get a good glimpse of the southern skies, look for the most massive star in the universe, and ponder that it might not even still be alive.

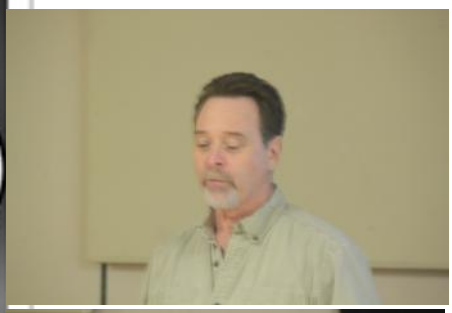


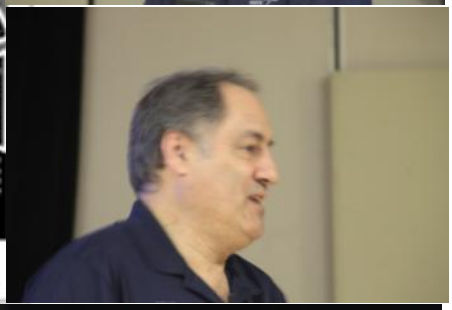
Images credit: ESO/IDA/Danish 1.5 m/R. Gendler, C. C. Thöne, C. Féron, and J.-E. Ovaldsen (L), of the giant star-forming Tarantula Nebula in the Large Magellanic Cloud; NASA, ESA, and E. Sabbi (ESA/STScI), with acknowledgment to R. O'Connell (University of Virginia) and the Wide Field Camera 3 Science Oversight Committee (R), of the central merging star cluster NGC 2070, containing the enormous R136a1 at the center.

What you missed last month…pictures by Roger Hill

Our speaker for the April meeting was Chris Talpas, our Librarian. Chris presented an excellent talk about Near Earth Objects; these are asteroids and comets that can cross or come very close to Earth's orbital path. Potential impactors were talked about and Chris' talk highlighted a number of past impacts and the frequency of these events. Further, Chris told of search efforts underway to discover and track these threats to Earth. He ended with a discussion of a number of options Humanity has to avert significant impacts.

See you next month!

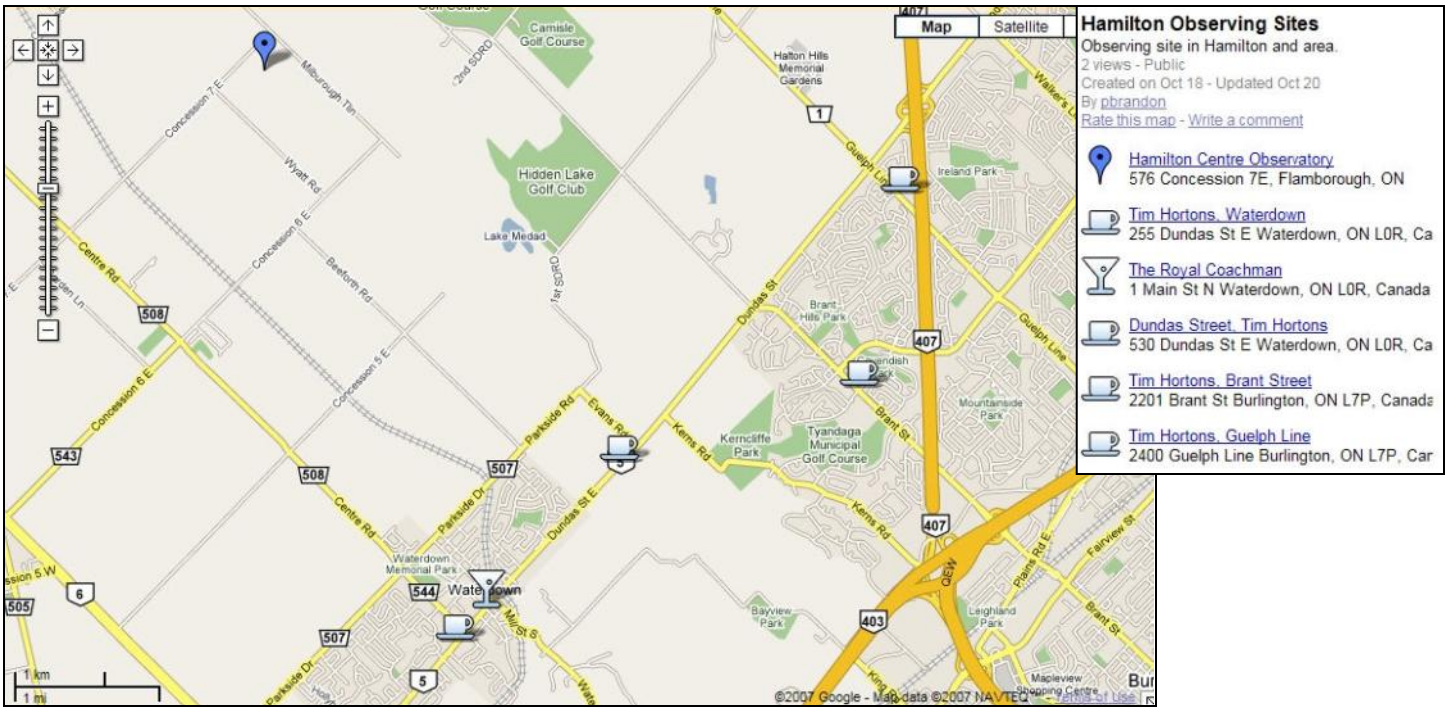




Calendar of Events

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
May 3 Full Moon: The Flower Moon	**May 4**	**May 5**	**May 6** Eta Aquariid Meteors	**May 7** **General Meeting in Waterdown:** Mercury at greatest elongation E. Best evening apparition of 2015	**May 8**	**May 9**
May 10	**May 11** **NOVA Session 6 at the Observatory, 7:30pm** Last Quarter	**May 12**	**May 13**	**May 14** **Board Meeting. Contact Gary Colwell for location.**	**May 15**	**May 16**
May 17	**May 18** Victoria Day New Moon	**May 19**	**May 20**	**May 21**	**May 22**	**May 23** Saturn in Opposition
May 24	**May 25** First Quarter CASCA annual meeting in Hamilton	**May 26** Lunar Straight Wall	**May 27**	**May 28**	**May 29**	**May 30**
May 31 Lunar X very early (1am) Lunar Straight Wall this evening.	**June 1** **NOVA Session 7 at the Observatory, 7:30pm**	**June 2** Full Moon: The Strawberry Moon	**June 3**	**June 4** **General Meeting in Waterdown**	**June 5**	**June 6** Venus at Greatest Elongation E

Mercury low in WNW after mid-month. **Venus** Low in W. in evening twilight. **Mars** very low in west at dusk. **Jupiter** high in S after dark. **Saturn** rises in SE after 11pm.



576 Concession 7 East, Flamborough ON
N43° 23’ 27” W79° 55’ 20”
Our mailing address has changed:
RASC Hamilton
P.O. Box 969
Waterdown, Ontario
L0R 2H0

Gary Colwell, President: President@HamiltonRASC.ca
Gary Bennett, Membership Director
Roger Hill, Orbit Editor: Orbit@HamiltonRASC.ca
Bill Leggitt, Treasurer
Mark Pickett, Vice President and Outreach Director
Dave Surette, Secretary
Will Gray, Outreach assistant.
Chris Talpas, Librarian

This Ring around the Moon was taken by Roger Hill using a Rokinon 8mm lens on a modified Canon T1i. It was a 30 second exposure at ISO 400. It was taken at the Observatory, after the NOVA session on April 27th. The bright “star” next to the Moon, is actually Jupiter.