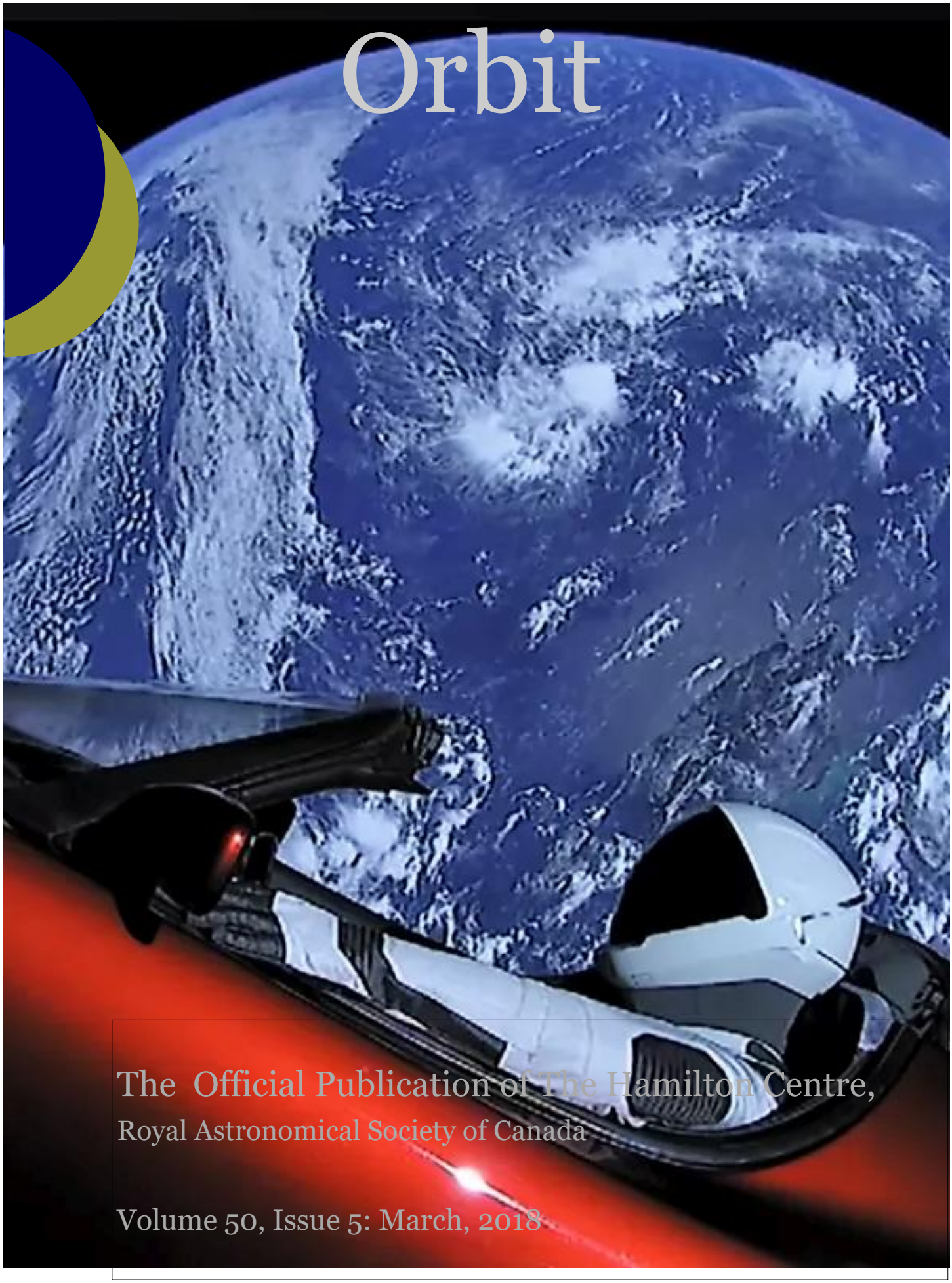
Orbit



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Issue Number 5, March, 2018
Roger Hill, Editor

March and April, September and October are the months that I like the best for observing. In the spring, the glories of Orion, Auriga and Taurus are easily seen in the early evening skies, with the Realm of the Galaxies coming later, followed by Scorpius and Sagittarius after midnight. The nights in September and October have them reversed.

Nights in the spring are warmer, but still long enough to allow you to do some observing without having to sleepwalk through work the following day. Nights in the Fall are free from mosquitoes. Often, the seeing is particularly good during these months, too, as they have less of the extreme dichotomy between daytime and night-time temperatures.

And so I greet March with much enthusiasm.

It also helps that some of the more momentous times of my life have been in March. I arrived in Canada on March 4, the first date with my future wife was on March 6, one of my favourite partial solar eclipses was on March 7, there were two trips to Chile in 2008 and 2016, and there's always St. Patrick's Day!

This year, we'll have Heavy M.E.T.U.L. Night #2, but more on that further inside these pages.

We'll have another night because the first one was so much fun, despite the clouds. It was a little less organized than I would have liked, but since I had no idea how many people would show up, or what they wanted, it was a fairly "play it by ear" sort of evening.

And it had to be! Late afternoon was beautiful, no clouds, a lovely blue sky and a temperature just below 0°...about as good as it gets in February. However, the clouds lurked along the horizon as I drove home, and by the time I arrived at the Observatory shortly after 7pm, the sky was mostly overcast, with just a few sucker holes where Orion and Sirius shone brightly.

Fortunately, it was the "L" that came through for us. The Moon was visible through thick clouds and thin, so that the four Maria I'd picked out for observation, and the four craters, could still be observed.

The 16" was put to good use, despite someone breathing on an eyepiece! However, since we have a few there, there was only an interruption in the viewing. I did mention that I'd seen an image quite a few years ago of one of the speakers at a General meeting using a snorkel to stop that from happening. Perhaps there'll be an evening of eyepiece cleaning instruction in the future!

One fellow brought out his new telescope, asking for some help. So the first thing we did was take it inside the main building and gave him some basic instruction. We also tried one of the Centre's 1¼" eyepieces, rather than the erecting image eyepiece he was using, as well as why most observers don't really care if the image is upside down and backwards.

It was also great to see some long-time and valued friends, too. I've spent many hours both in the dark and in Board meetings with Scott and Ev, and it was great to have a couple of experienced observers.

Roger

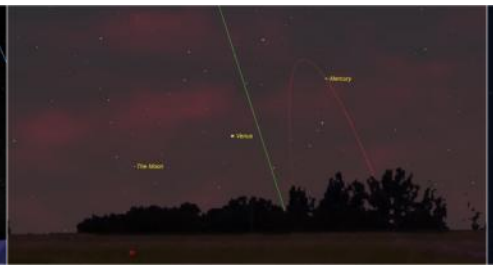
What's up in the February Sky from Troy McCoy

March 1 evening – Full Moon passes Regulus
When the full moon rises late on the afternoon of March 1, it will sit about 2 degrees above the bright star Regulus in Leo. Through the evening, the moon's eastward orbital motion (green line) will carry it past the star, with closest approach around shortly after 1 a.m. EST.

March 5 at 7 p.m. EST – Inner Planets Meet Up
In the early evening on March 5, Mercury will sit only 1.5 degrees to the upper right of much brighter Venus. The pair of inner planets will appear low above the western horizon for a short period after sunset, with the optimal time for seeing them between 6:30 and 7 p.m.

March 7 midnight to dawn – Moon near Jupiter
When the waning gibbous moon rises just before midnight on Tuesday evening, it will be positioned 3 degrees to the upper left of Jupiter. The pair of naked eye objects will cross the sky together during the wee hours, eventually moving to a point low in the south-western pre-dawn sky on Wednesday morning.

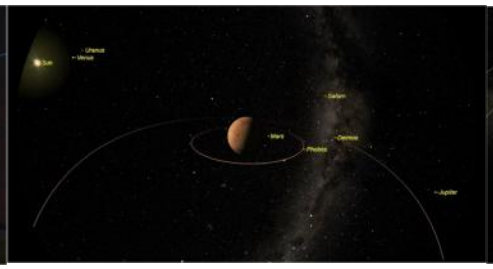
March 11 pre-dawn – Old Moon meets Saturn
Completing its eastward passage through the pre-dawn planets this month, on the morning of Sunday, March 11, the old crescent moon will sit 4 degrees to the left of the yellowish planet Saturn. Look for the pair of objects low in the south-eastern sky between 5 and 7 a.m



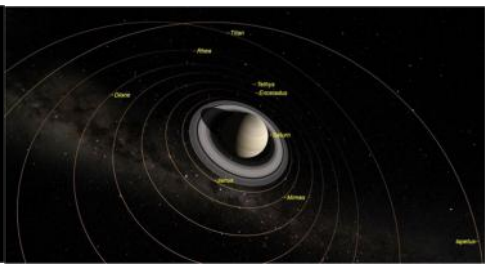
March 18 after sunset – Moon Venus and Mercury
For about an hour after sunset on March 18, the very young crescent moon will form a tight line with bright Venus and much dimmer Mercury low in the western evening sky. The trio will fit within the field of view of binoculars and make a terrific photo opportunity.

March 22 at 7 p.m. EDT – Moon near Aldebaran
In the southwestern evening sky, the waxing crescent moon will pass just to the upper left of Aldebaran, the brightest star in Taurus. Closest approach will occur around 7 p.m. EDT (11:00 GMT). There will be an occultation is some parts of the world, but not in Hamilton.

March 28 - Venus buzzes Uranus
Venus, our sister planet, will pass only 4 arc-minutes from the distant blue-green ice giant planet Uranus. Binoculars or telescopes will be needed to see dim Uranus next to Venus' bright glare. The two planets will easily fit within the field of view of a backyard telescope. The best time to see the pair comes after the sky darkens around 8:30 p.m. Venus will be 10,000 times brighter so you might have to put it slightly outside the field of view to see Uranus at first.



Mars will spend March in the south-eastern pre-dawn sky - rising every morning about 3 a.m. local time. On March 12, its eastward orbital motion will carry it from southern Ophiuchus into Sagittarius. For the rest of March it will traverse the rich star fields of the Milky Way, passing squarely between the Lagoon and Trifid nebulas on March 19, and then ending the month within 2 degrees of Saturn and 1 degree from Messier 22.



Saturn will be easily observable in the southeastern pre-dawn sky during March, appearing as a yellowish, visual magnitude 0.6 object located above the Teapot asterism of Sagittarius. Over the course of the month Saturn will rise earlier while it climbs away from the sun. All month long, dimmer Mars will move steadily eastward towards Saturn, ending the month only 1.6 degrees to the lower right of the ringed planet. On the mornings of March 10 and 11, the old crescent moon will hop over Saturn. And on the mornings around March 20, Saturn will pass about 1.5 degrees above the globular cluster Messier 22.

Monthly Sky watching information is provided by Chris Vaughn of Starry Night Education
Chris is a member of Toronto Centre - RASC
Follow Starry Night on Twitter @starrynightedu and Chris at @astrogoeguy

What Is the Ionosphere?

By Linda Hermans-Killiam

High above Earth is a very active part of our upper atmosphere called the ionosphere. The ionosphere gets its name from ions—tiny charged particles that blow around in this layer of the atmosphere.

How did all those ions get there? They were made by energy from the Sun!

Everything in the universe that takes up space is made up of matter, and matter is made of tiny particles called atoms. At the ionosphere, atoms from the Earth's atmosphere meet up with energy from the Sun. This energy, called radiation, strips away parts of the atom. What's left is a positively or negatively charged atom, called an ion.

The ionosphere is filled with ions. These particles move about in a giant wind. However, conditions in the ionosphere change all the time. Earth's seasons and weather can cause changes in the ionosphere, as well as radiation and particles from the Sun—called space weather.

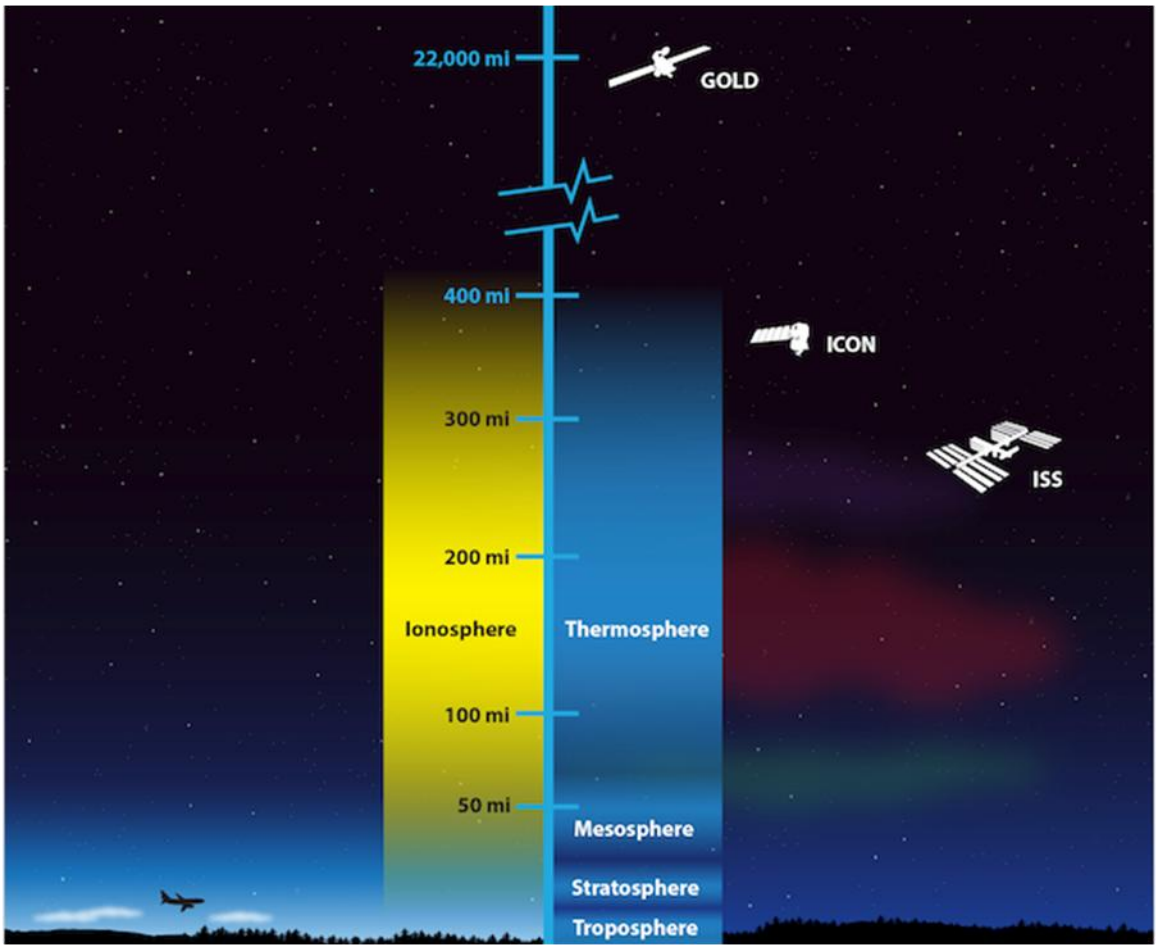
These changes in the ionosphere can cause problems for humans. For example, they can interfere with radio signals between Earth and satellites. This could make it difficult to use many of the tools we take for granted here on Earth, such as GPS. Radio signals also allow us to communicate with astronauts on board the International Space Station, which orbits Earth within the ionosphere. Learning more about this region of our atmosphere may help us improve forecasts about when these radio signals could be distorted and help keep humans safe.

In 2018, NASA has plans to launch two missions that will work together to study the ionosphere. NASA's GOLD (Global-scale Observations of the Limb and Disk) mission launched in January 2018. GOLD will orbit 22,000 miles above Earth. From way up there, it will be able to create a map of the ionosphere over the Americas every half hour. It will measure the temperature and makeup of gases in the ionosphere. GOLD will also study bubbles of charged gas that are known to cause communication problems.

A second NASA mission, called ICON, short for Ionospheric Connection Explorer, will launch later in 2018. It will be placed in an orbit just 350 miles above Earth—through the ionosphere. This means it will have a close-up view of the upper atmosphere to pair with GOLD's wider view. ICON will study the forces that shape this part of the upper atmosphere.

Both missions will study how the ionosphere is affected by Earth and space weather. Together, they will give us better observations of this part of our atmosphere than we have ever had before.

To learn more about the ionosphere, check out NASA Space Place: https://spaceplace.nasa.gov/ionosphere



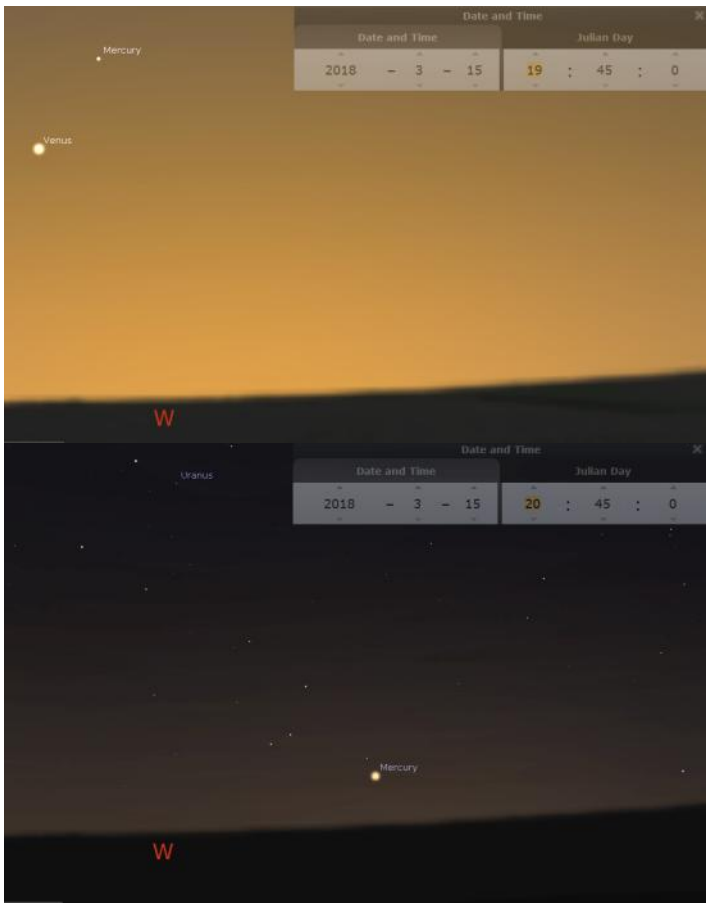
This illustration shows the layers of Earth's atmosphere. NASA's GOLD and ICON missions will work together to study the ionosphere, a region of charged particles in Earth's upper atmosphere. Changes in the ionosphere can interfere with the radio waves used to communicate with satellites and astronauts in the International Space Station (ISS). Credit: NASA's Goddard Space Flight Center/ Duberstein (modified)

Heavy M.E.T.U.L. Night #2 by Roger Hill

Since the first night was so much fun, we're going to do this again on March 15th. If you look at your RASC Observers Calendar, you'll notice that it's just a couple of days before New Moon, so the Lunar portion won't be applicable that night (sorry, Lunar enthusiasts).

There are, however, some really cool things going on. It is the evening of greatest elongation East for Mercury, making it the best evening this year to see the innermost planet. Many people have never seen Mercury...in fact, some observers only make an effort to see it as it crosses the Sun, like it did in 2016, and will do next year in November.

March the 15th, though, is a good night to see it because you can use bright Venus as your signpost. Using binoculars will help to locate it, and hopefully allow you to see it with just your eyes as the twilight skies darken.



So...Bring your binoculars for this one AND a tripod to put them on, because one hour later there will be another event that you won't want to miss: Uranus will pass through the same binocular field!

I'll open up the observatory gates a little earlier for this, as we'll want to get going at 7:30pm. Initially, we'll go out onto the grassy area beside 7th Concession East and look at Venus and Mercury. At 7:45, put Mercury about 1/2 of the field of view of your binoculars to the left side. An hour later, Uranus will pass through about 3 degrees to the right of where Mercury was.

Perhaps we'll take one of the Dobsonians out to the berm so we can be sure that Uranus is actually a tiny disk!

There will also be an Iridium flare at 21:19 and this means that you can fulfill 4 out of the 5 requirements for the Solar System portion of the Explore The Universe certificate. Actually, if you see a meteor that evening, you can do 5 of them!

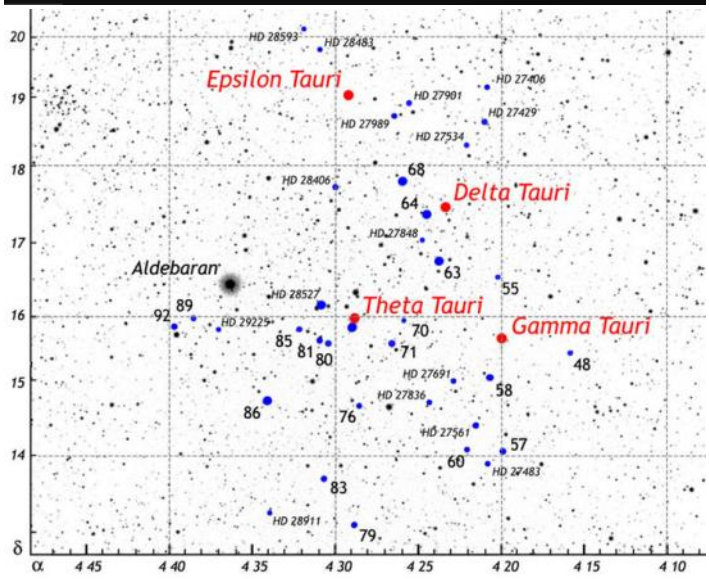
We'll have a look at three lovely open clusters: M35 in Gemini, M47 east of Sirius in Puppis, and M45 in Taurus. Also on the list will be M42 in Orion, because you should always look at M42 if it's visible! M42, M47 and M47 are also on the ETU list, so it could be a busy evening!

We'll point the 16" at the Leo Trio, too...for a treat, as well as The Eskimo Nebula (NGC 2392) .

Finally, there is a double star: θ-1 and θ-2 (theta 1 and 2) Tauri. Although the ETU Guide lists δ (delta) Cephei as a winter object, it's much higher up in the sky in the Fall.

If the weather is unco-operative, then perhaps we'll talk about magnification, apparent and actual field of view, eyepieces and how Barlow lenses work.

See you in the dark!



From Orbit, April 2008: Some things I learned in Chile by Roger Hill

There are several lagoons that are actually a saturated salt solution. It really hurts the eyes of those who are stupid enough to try to swim in the stuff, like me. This was one of the most bizarre swimming experiences in my life: we floated upright in the water, hands above our heads, but the water came to just below our armpits.

Raul, the Bolivian helper, and general handyman, has three years of a four year Civil Engineering degree, but in Chile he makes an excellent wage: $20 a day— three times the amount he could earn in Bolivia. Raul and his wife, Soledad—the housekeeper, had two delightful children (boys, 3 and 5 years old), but they rarely smiled or laughed, until we bought a soccer ball for them, and we kicked it around for an hour. Every boy needs a ball to play with.

I have to mention Alain Maury, the proprietor of the place, who looks like Odo from Star Trek: Deep Space 9. He gives talks twice every clear night to 40 or 50 people, and hates having to drive to Calama, the major town of 150,000 people, just two hours away on the other side of a 12,000 foot high mountain range. He has a wicked sense of humour, loves his wife Alejandra, and is as knowledgeable as anyone I know about astronomy. It was he who coined the term “Canadian Hello”, wondering if a certain vulgar phrase (not fit for such an august publication as this), was Canadian for “Hello”. His wife loves Maple Syrup, and if you ever travel down there, take some for her, along with the Maple Cookies made by Christies.

If you ever want to see what a Telescope Graveyard looks like, visit Alain Maury during the day, and see bits and pieces of all sorts of telescopes lying around. At 5% humidity, they’re not going to rust very quickly! You have to do it during the day, because you don’t want to look down at night.

Can’t leave out the climb up an extinct volcano called Cerro Toco, where 2/3rds of the group got a chance to see inside the groundshield of the Atacama Cosmological Telescope, and spoke to the lead researcher for the telescope, a really nice guy from Princeton called Mark Devlin. He was most concerned about our adaptation to altitude. I didn’t expect to see him as an email indicated that the place would be closed, and he didn’t expect to see us, as he thought we’d be by earlier in the week. At 17,030 feet above sea level, it is currently the highest permanent, ground-based telescope in the world. Of course, we’d nearly killed ourselves getting up there, when we were laughing so hard, we literally couldn’t catch a breath.

Bolivia must be an awful place to live...about 90 percent of the nights they had lightning there. The border with Bolivia is only about 50 km away. So is Argentina. To get there, you have to go over a 15,000 foot high “pass”. Some cars can’t go that high. They won’t let the rental vehicles in to either of those countries.

I can’t not discuss the stars. The first night, we walked out of a restaurant and looked up. To the first glance, it looked like it was cloudy, and then we realized it was the Large Magellanic Cloud and the Milky Way we were seeing. Awesome, just, well, awesome!

The Southern Cross. There’s a couple of “false crosses” in the southern skies, but only one has the Coal Sack beside it. Makes it stand out a lot more. It’s used to point to the south pole, too. 4.5 times the distance of the long axis from the bright star Alpha Crucis will get you pretty close.

Polar aligning can be real tough down there. You don’t know how bloody handy Polaris is until you try to polar align below the equator. Andy and Gordon were having a real tough time getting aligned properly. Fortunately, right beside where they were set up was a Takahashi. The mount had a polar bore scope, so I shone my green laser through the bore scope so they could see where to align to. Worked perfectly.

Another tip...when you travel, leave your fancy power bars at home, and just get one of the cheapest ones you can find at the local dollar store. Surge protectors don’t like 220 volts, and the so called intelligent power bars have a conniption fit and flat out refuse to work when there is no ground worthy of the name. Finally, take nothing that won’t work on 220Volts.

Doesn’t matter what I’m actually doing. Caulking will be involved.

I have a horrible reputation for bringing cloud and rain wherever I go observing. I went to the Mexican desert for a solar eclipse, and had to observe it through some pretty major clouds. In the satellite weather pictures, there is a single cloud visible on the entire Baja Peninsula. That’s where I was. Les and I went to Texas and had 1.5 good nights out of 7. When a fog bank rolled on to the upper observing field at 3am, Les started to believe I was jinxed. There’s a standing joke around the Centre that if I announce an occultation then it WILL be cloudy. I’m 0 for 9 in asteroid occultations. Well, I’ll have you know there was only a single cloudy night while I was there. The irresistible force of my clouds met the immovable object that is the Atacama Desert. This desert won. Which is good...it means I got to live!

One night, around 3am or so, after the Moon had set, Steve and I just looked in slack-jawed wonder at the Milky Way. There’s no doubt that you’re looking at an edge-on spiral. If you’ve never seen it like that, you’ve never seen it properly.

Having a geologist with you is a good idea.

You don’t need a lot of Spanish. “Por Favor” and “Gracias” will take you a long way. People will generally smile as you mangle their language, as long as you’re trying. However, this sometimes means that six guys all order the exact same thing.

There’s a pretty good chance that one of the guys you have to room with snores. Loudly. He will feel very badly about it. Earplugs really help. Should he move out to a different room, the guy who replaces him will be worse. This is called Kevin's Law.

Never stand behind a vehicle after Steve starts it up. This is called Derek's Law.

I didn’t see the impact crater, I didn’t see the geysers, I didn’t see the local archeological ruins or the museum. Guess I’ll have to go back.

The era of extremely large telescopes by Jeff Foust

Ground-based observatories rarely attract the attention, and controversy, of large space missions. The Thirty Meter Telescope (TMT) has been an exception to that.

TMT has been the subject of political debate, protests, and lawsuits in recent years, based on opposition from some native Hawaiians to plans to build the observatory atop Maunakea on the Big Island of Hawaii. A Hawaiian court ruled a state agency had improperly awarded a construction permit for the telescope, forcing the organization developing the TMT, the TMT International Observatory (TIO) LLC, to go through a new "contested case" process for a permit.

At the same time, the organization was developing a backup plan. In October 2016 it announced the selection of a backup site, Observtorio del Roque de los Muchachos (ORM) on La Palma in the Canary Islands. Planning for developing TMT there has been going on in parallel with the ongoing legal process in Hawaii. At a meeting last January of the American Astronomical Society (AAS) in Texas, telescope officials suggested a decision on whether the build TMT in Hawaii or La Palma would be made by that fall (see "Decision time for the Thirty Meter Telescope," The Space Review, January 9, 2017).

A year later, that decision is still forthcoming, but project officials said they plan to make a choice soon. "Maunakea certainly remains our preferred site for TMT. ORM is an excellent alternative should Maunakea prove impractical," said Tom Soifer, a Caltech physics professor and member of the board of the TMT International Observatory, during a town hall meeting about the telescope at the AAS meeting early this month in suburban Washington. "Our board, the TIO board, will be making a decision about the site in the spring of 2018, with a plan to initiate construction as soon as possible thereafter."

The two sites will be in different stages of readiness if the TIO board sticks to that schedule. The TMT won a victory in Hawaii in September when the Hawaii Board of Land and Natural Resources approved a new construction permit for the telescope atop Maunakea. But, Soifer noted, opponents of the telescope appealed the decision to the Hawaii Supreme Court, even as the state appealed the ruling the required the contested case hearing in the first place. "You'd be amazed at all of the things lawyers can find to do," he said.

On La Palma, the process has been much smoother. Construction planning documents are nearly complete for the ORM site, Soifer said, and an environmental impact had been submitted to the local government. With no evidence of significant opposition to the telescope, he said he expected the government to issue a permit for building TMT there by February or March.

Maunakea, though, remains the preferred site for several scientific reasons. The lower latitude of Maunakea will allow the telescope to see more of the southern sky than at ORM. The lower altitude of ORM—more than 1,500 meters below Maunakea—means more water vapour in the atmosphere, affecting infrared observations. "For wavelengths beyond about 2.5 microns, observations for longer wavelengths are compromised" there versus Maunakea, Soifer said.

The legal dispute in Hawaii, though, won't be completed by the planned April deadline for a decision. "The appeals have been filed, but the court has not made any indication of what it wants to do with those appeals," Soifer said after the town hall meeting. "The best case would be late spring or early summer of 2018." Even if a decision leads to work starting this year, Soifer said it would not be until the late 2020s before the TMT is ready to being observations. "If we start construction during 2018, we should be seeing first light about a decade later," he said.

The other large telescopes

TMT is not the only so-called "extremely large telescope" under development. Two others are also in early phases of development in the Southern Hemisphere that have largely escape the controversy surrounding the TMT.

One is the European Southern Observatory's Extremely Large Telescope in Chile. Like the TMT, it will consist of hundreds of small mirror segments—798, to be exact—that will be combined to form a single mirror with a diameter of 39 meters. The observatory announced this month that first six of those segments have been cast at a German factory, keeping the project on track for a first light in 2024.

The other is the Giant Magellan Telescope (GMT), which will also be built in Chile. Unlike the other two projects, it plans to use seven large mirrors, each 8.4 meters in diameter, creating an effective aperture of 24.5 meters. The project started casting the fifth of those seven mirrors in November.

"We're now at the stage that we're really into construction. It's becoming a real thing now. We're building a lot of optics. We're under contract to build the telescope and we're just about to get under contract to starting digging holes on top of the mountain" for the observatory, said Pat McCarthy, vice president for operations and external relations at the Giant Magellan Telescope Organization, in an interview during the AAS conference.

By 2021, he said, "things will really start to show up on the mountain" as the observatory building nears completion. By 2024 and 2025, he said, the mirrors will be installed and operations will begin.

Building the mirrors, he said, is the long pole in the project schedule, taking about five years to go from a pile of glass to a completed, polished mirror. "If you couldn't do more than one mirror at a time, it would be hopeless," he said. "We can be working on four to five at a time."

Those mirrors posed a number of technical challenges. That size, he said, is near the maximum feasible size for a monolithic mirror, given factors ranging from the time it takes for the glass to cool after casting to its weight and risk of breakage. While other telescopes, like the TMT and the Extremely Large Telescope, are using large numbers of small segments to create a large mirror, "we've gone the other approach, deciding it's best to have as much contiguous surface area as you can, so we make the biggest possible segments."

However, not all the segments are alike: the seven segments have to be aligned so that most of them have off-axis shapes. "You have to polish eight-meter mirrors that have off-axis figures, and that's turned out to be hard," McCarthy said. "That was the biggest technical challenge: how do you make these complex, off-axis mirrors." The project has figured out how to do so, he said, and is now looking at how to speed up the production process.

Another challenge is the telescope enclosure, which eschews the standard spherical dome shape for a cylindrical structure that is the equivalent of a building 20 to 22 stories tall. That structure needs to move around and be open as well. The project, he said, brought in Boeing to leverage its expertise in computational fluid dynamics and wind tunnel testing to model the structure's aerodynamics. "While we are not flying, we are experiencing some of the aerodynamics effects, the turbulence effects, which they deal with," he said of Boeing. "They've been a very good partner helping us model the structure and optimize some of the architectural choices before we finalize those in concrete."

There are also financial challenges. The GMT has an estimated cost of $1 billion, and when the project started its various partners provided more than $500 million to begin development, with some more raised since. "That's enough to get us through all the remaining design work, keep the mirror production going, to start the construction," he said.

However, the project still needs to raise an undisclosed amount to fully pay for the telescope. "We've got a fundraising operation that is up and running. We're making good progress with meeting with prospective donors," he said. "I think we're in good shape on that. It's just going to be an uphill climb."

One advantage McCarthy said that the GMT will have over the other two large telescopes is that its "fast" optical design and wider field of view. "Because of this compact optical nature, it's easy for us to build conventional instruments: conventional spectrographs, conventional cameras," he said.

One of the initial instruments available at the GMT will be high-precision, high-resolution spectrometer, which the other two observatories will not have when they open since the optical designs of those telescopes make such instruments more difficult to design. "TMT and the European ELT will have those eventually, but they're much harder to build," he said. "It probably will take them a little longer."

Ultimately, though, all three extremely large telescopes, whenever and wherever they're completed, will be doing similar science. "The global community of people working on these big telescopes are all interested in pretty much the same big science questions," he said. "Where did we come from? What's the universe made of? How is it evolving? Where are we going? These are the basics that we all are dealing with, but the structure of how you go about it differs from one project to another."

Outreach in January by Ed Mizzi

The Hamilton Centre had a busy Outreach schedule in January, 2018. Four different schools in the Hamilton & Halton regions benefitted from our expertise in helping young people explore the universe.

On January 11, the grade 6 students at Queen Victoria Elementary School in Hamilton were treated to a two hour session that included a slide show, discussion and astronomy activity games. See photo.

On Jan. 16, the grade 11 Physical Geography class at Christ the King Secondary School in Georgetown, was exposed to fascinating information about the solar system and its wide variety of objects, from planets to comets and everything in between. It gave them a sense of why studying other bodies (planetary science) can help us better understand the physical nature of planet Earth.
On Jan. 19, at St. Ignatius Secondary School in Oakville, about 150 students, in 6 different grade 9 science classes, learned about the relative sizes in our solar system, galaxy and universe, through the use of slides, simulations and discussion.

Finally, on Jan. 26, the Hamilton Centre visited St. Andrew Elementary School in Oakville, where the grade 6/7 class was treated to an entire day of slide shows, simulations and activities about astronomy and the universe.

It is through programs such as these that the Hamilton Centre fulfills the mission of the RASC, i.e. “To enhance understanding of and inspire curiosity about the Universe, through public outreach, education, and support for astronomical research.”

In addition, members who volunteer and visit schools, guides, scouts and libraries, etc. will tell you just how rewarding it is to share knowledge about our great hobby and this fascinating world of astronomy. There is simply nothing more exciting than hearing the “wows” and “awes” of people, of all ages, when hearing about the universe and/or looking through a telescope at a distant object in the sky.

February 2018 Monthly Meeting by Ed Mizzi

On Feb. 1, 2017, the Hamilton Centre met for its regular monthly meeting. Attendance was great, with about 40 people present, many from the general public, and everyone was looking forward to the lecture by Dr. Laura Parker.

Ed Mizzi began the proceedings with a welcome to everyone. He displayed a slide with the agenda on it and briefly introduced the topics for the meeting. He mentioned several club activities and advantages of membership and encouraged people to get involved.

Ed introduced Bob Prociuk, Board member, whose portfolio includes vice president and memberships. Bob discussed the benefits of membership at the Hamilton Centre and the Royal Astronomical Society of Canada. He welcomed all new members. Our total is now 116. That's two more than in January!!

Then Ed Mizzi discussed outreach and also encouraged members to participate in these fun and enjoyable activities with the public. Ed mentioned 4 events that occurred in January, including visits to Queen Victoria Elementary in Hamilton, Christ the King Secondary in Georgetown, St. Ignatius of Loyola Secondary in Oakville and St. Andrew Elementary in Oakville. Hopefully the rest of 2018 will see similar fun events, with more members participating.

Next, Ed mentioned notable events that would occur during the month of February, including a Volunteer Fair in Waterdown on Feb. 3, our Board meeting on Feb. 8 and Astronomy on Tap on Feb. 9.

Roger Hill was then introduced. Roger discussed a new initiative he is calling Heavy M.E.T.U.L. (Messier Explore the Universe Lunar) where members could join him at the observatory and make attempts at procuring RASC certificates for studying the night sky. The inaugural event will happen on Feb. 22 and all members are welcome to bring their own telescopes or use one of the club's loaner Dobs.

Roger then mentioned the 50th Anniversary of Orbit and talked about some of its history, from the variety of editors to the different formats used as technology changed. Roger has now digitized all of the editions, a massive undertaking, so that they can continue to be read and cherished into the future.

Roger next, using several slides, told his story of visiting the Atacama Desert in Chile and his excitement while talking about his trip was almost palpable.

Ed then discussed the March 1 meeting and what will be on the agenda, from Show and Tell (images, equipment, etc.) and What's UP in March, to having a telescope clinic and our first Trivia Contest.

We then took a 10 minute break to give people a chance to stretch and chat with fellow members.

After the break, Bob Prociuk introduced the night's guest speaker, giving an excellent summary of the work that Dr. Laura Parker has been involved with and a brief introduction to her topic.

Dr. Parker's lecture title was "The Dark Universe", an overview of the techniques used to map the universe on the largest scales, which have enabled us to measure dark energy and dark matter. Her talk was very interesting and informative and she utilized great images and analogies to help us understand the science behind here area of study.

Bob thanked Dr. Parker with a gift of appreciation for the time she spent both preparing and providing her findings.

Ed then adjourned the meeting but not before informing members of three upcoming meetings:
- February Board meeting, at the observatory, Feb. 8, 8 PM. All members are welcome.
- March Monthly meeting, at the Legion, Mar. 1, 8 PM. Members and the Public are welcome.
- March Board meeting, at Andy Blanchard's home, Mar. 8, 8 PM. All members are welcome.

Thanks to all who attended. Thanks to Abigail Hughes for taking photos of the proceedings.

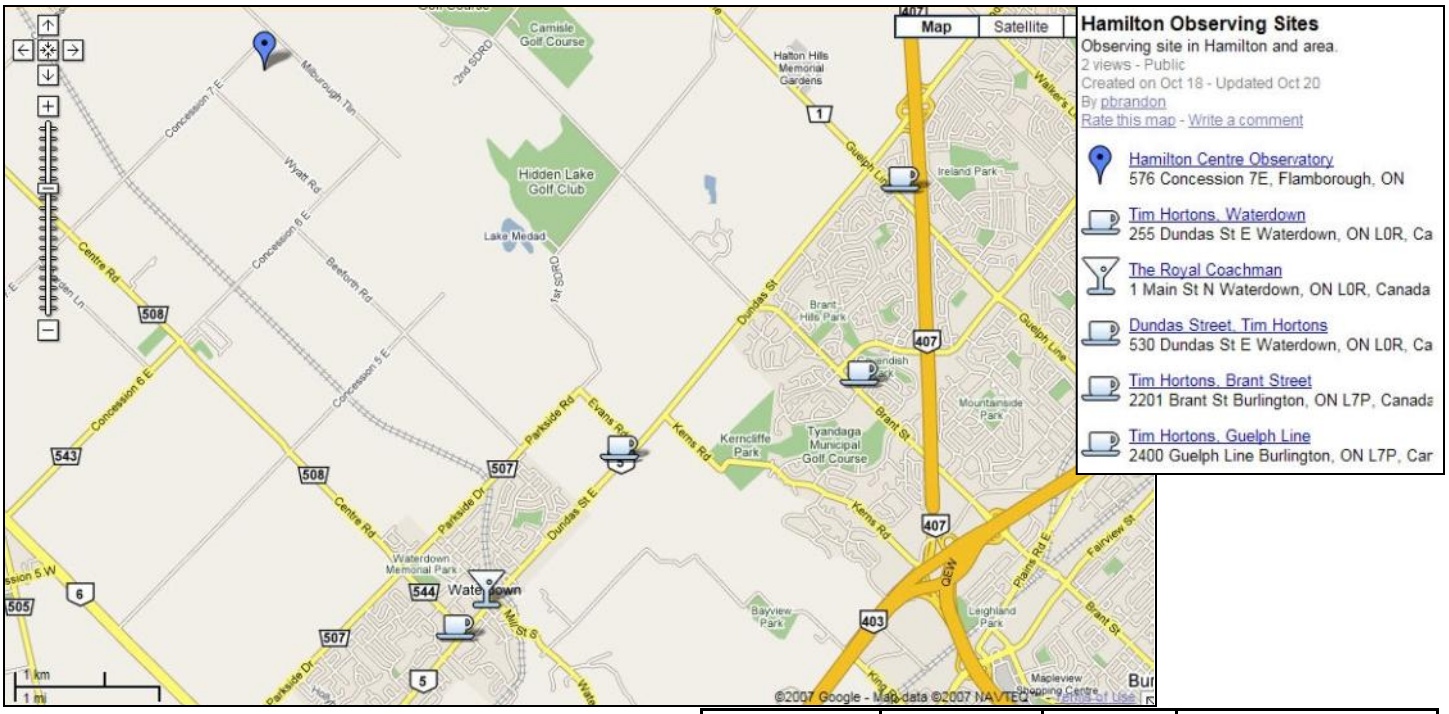
Top left: Dr. Laura Parker keeps the audience fascinated

Top Right: Bob Prociuk thanks D. Parker for her excellent talk.

Middle Left: Colin Haig bringing us News from National!

Bottom left: Chatting for a few minutes before the Speaker.

Bottom Right: Roger monopolizing the stage (again).



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