

# NOVA

NEWSLETTER OF THE VANCOUVER CENTRE RASC  
VOLUME 2020 ISSUE 4 JULY/AUGUST 2020



## Barry Shanko 1960-2020

by Chris Gainor

Barry Shanko, who served for more than three decades as Vancouver Centre's Speaker Coordinator, passed away unexpectedly at the end of April, just days before what would have been his 60<sup>th</sup> birthday.

The news of Barry's passing saddened many people at the Vancouver Centre and elsewhere. "Barry had an amazing talent for reaching up and catching the stars," said Scott McGillivray, who followed Barry as Speaker Coordinator. "He'd call up Nobel Prize winners and the most senior researchers at NASA, somehow convince them to visit our little club in Vancouver."

Barry received the Vancouver Centre Appreciation Award in 1991 and 2008, and he was to receive the RASC President's Award at the time of the 2020 Virtual General Assembly in June.

He became Speaker Coordinator

in 1986 and served in that position until 2016, when he was obliged to step down due to his need for kidney dialysis. In February last year, Barry received a kidney transplant, and his



improving health allowed him to return to Vancouver Centre activities. After he died in his Marpole apartment at the end of April, shortly be-

fore his birthday on May 2, the cause was deemed to be renal failure.

Barry graduated from John Oliver Secondary School in Vancouver in 1978, and studied electronics at Vancouver Community College and later writing at Langara College and Simon Fraser University.

Starting in 1994, his science writing appeared in publications including *Air and Space Smithsonian*, *Spaceflight*, *Quest: The History of Spaceflight Quarterly*, *Astronomy Now*, and *space.com*. As a technical writer, he produced online help guides, user guides, training materials, ISO/Work instructions and marketing materials. His training manual won an award at the 2009 competition of the Society for Technical Communication, Canada West Chapter.

Over the years, Barry lived with the

continued on page 6

**JULY 9**

A selection of short talks on astrophotography followed by a Trivia Night. Details and Zoom link on Meetup.

**SFU**

**SFU**

**NO MEETING IN AUGUST**

**SEPTEMBER 10**

Speaker TBA. See Meetup for updates.

**SFU**

**SFU**

# Is the Sun Getting More Active?

by J. Karl Miller

Recently (June 28), I set up my Lunt solar-observations-only telescope (below—it contains the proper Hydrogen-alpha light filters to cut the sunlight to the correct, safe level). I was hoping to see some activity. In the last couple of years there has been very little of that. We may just have gone through a minimum of the eleven-year Sun cycle. The state of the solar cycle is determined by solar observatories world-wide, counting the number of sunspots over the years.

Looking through my solar telescope, the Sun did show a number of prominences which had also been absent for a lengthy period. I did not see any sunspots, though. There were a few dark streaks; these are prominences which we see “from above.” They are just like the ones we see at the Sun’s edge, but they originate on the surface away from the edge. They look darker because, as they move away from the surface, they cool down and therefore emit a little less light. This is obvious when looking at prominences at the edge of the Sun, which are also fainter than the Sun’s surface. Here is a picture I took of the Sun some years ago; it is similar to what I saw on

June 28.

The diameter of the Sun is 104 times that of Earth. If you mentally string 104 Earths across the Sun and compare the size of the prominences in the picture, it becomes obvious that the prominences easily exceed the size of the Earth. The hydrogen gas and



Lunt H-alpha telescope

plasma of which the prominences are composed follow magnetic lines of force. Magnetism and its constant changes are a major part of the Sun’s activity. I think of the Sun as a magnetized cauldron. Solar material is constantly being stirred and ejected and,

if the force of the ejections are strong enough, this material will disperse into space. The Earth is often in the path of such material; northern and southern lights are one effect. There are also interferences with wireless communications and power grids. Astronauts in space have to be protected as much as possible from this powerful radiation.

I think that we are finally entering the next solar cycle. The cycle should actually have a 22 year length. When sunspots appear as a pair, for instance, the leading spot (in the direction of the Sun’s rotation) could be magnetic north polarity. The following spot in the pair then has the south polarity. After the next minimum occurs, sunspots in the next eleven year period reverse their paired relationship polarity (south leading, north following). Nobody has a good explanation for the cause this

characteristic. The next eleven-year period after the preceding two then exhibits sunspot pairs with leading north and following south polarities again. Many other solar phenomena, such as solar flares, coronal loops, solar

continued on page 9

# President's Message

by Gordon Farrell

When Vancouver Centre agreed (back in late 2019) to host the 2020 RASC GA, we couldn't have known what we were getting ourselves into. The assumption was that this would be like other General Assemblies, with fellow RASC members coming from across the country to attend lectures, see the sights, and go about the formal

business of the AGM. And so it was that Hayley Miller and the rest of the GA Committee began planning the event until it became clear this would not be a typical GA after all. But to their credit, the entire team pivoted towards organizing the first-ever Virtual GA. The official business still happened on the weekend of June 6th, along

with the featured speakers—Sara Seager, Bob McDonald, and astronaut Joshua Kutryk—but instead of ballrooms and meeting halls, it was living rooms and webinars. We couldn't all get together and reminisce with our fellow astronomy enthusiasts but it was still a successful event in these difficult times.

continued on page 4

## About RASC

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

Membership is currently \$89.00 per year (\$52.00 for persons under 21 years of age; family memberships also available) and can be obtained online, at a meeting, or by writing

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

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

NOVA, the newsletter of the Vancouver Centre, RASC, is published on odd-numbered months. Opinions expressed herein are not nec-

essarily those of the Vancouver Centre.

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

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

## 2020 Vancouver Centre Officers

**President** Gordon Farrell  
president@rasc-vancouver.com  
**Vice-President** Alan Jones  
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**Secretary** Suzanna Nagy  
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**Past President** Leigh Cummings  
**At Large** Howard Trotter, Bill Burnyeat  
**Honourary President** J. Karl Miller

## Library

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

## On the Internet

rasc-vancouver.com  
astronomy.meetup.com/131/  
www.facebook.com/RASC.Van  
www.instagram.com/rascvancouver/

 @RASCvancouver

## Mailing Address

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9000 University High Street  
Burnaby, B.C.  
V5A 4Y0

## Map to Meeting Site



## IMPORTANT NOTICE:

Our lectures have moved online until further notice due to COVID-19 and SFU having shut down most on-campus activities.

We will resume our physical lectures at SFU once it is deemed safe to do so.

continued from page 3

But there were many more speakers that we had invited to speak at the GA, so we planned an additional two weekends of streamed lectures that finished up on June 21st. You can read the full details of the “GA Lite” on page 5 of this issue.

I'd like to congratulate Hayley Miller and the rest of the GA Committee for effectively planning *two* events in quick succession (the physical GA and the virtual one) and pulling it all off so smoothly. Thanks to Janelle Berry, Matthew Cimone, Charles Ennis, William Fearon, Ken Jackson, Jennifer Kirkey, Pomponia Martinez, Jaymie Matthews, Ian McLennan, Marina Miller, Meredith Miller, Doug Montgomery, and Colleen O'Hare. An excellent job done by all!

After putting in all this hard work, Hayley has also decided to step down as our National Representative, so we're looking for someone to fill this position. If

you're interested in representing Vancouver Centre at the national RASC level, please contact any Vancouver Centre council member. Again, we thank Hayley for her work in this role.

I'd also like to congratulate our webmaster Ken Jackson on earning his *Astroimager – Solar System* certificate. This certificate requires one to image the Sun, Moon, Venus, and at least two of Mars, Jupiter and Saturn (the latter two including moons). Well done, Ken!

I should also mention that the latest cancellations due to COVID-19 are the two summer star parties in BC, the Mt. Kobau Star Party and the Merritt Star Quest. We look forward to these events resuming next summer.

On a more sombre note, we lost an important member of our Centre in late April: Barry Shanko. His friend Charles Ennis has written a fitting tribute which you'll find on the front page of this issue, and Scott McGillivray shares his thoughts on page 9, but I also

wanted to say a few words. Barry's contributions to the Vancouver Centre over the decades are hard to understate. As our Speakers Coordinator, he somehow found us an impressive list of speakers both local and international to come and speak to our group of amateur astronomers and space enthusiasts. We still don't know how he convinced all these people to come to talk to us but convince them he did.

We were all expecting the best when Barry received his new kidney early last year. He had expressed his desire to become more active again in the Centre around the middle of last year and had begun to attend some of our lectures again so we were shocked and saddened to learn of his passing. He will be missed by the members of our Centre both as a colleague and a friend.

Think of Barry the next time you look up at the stars. I'm sure he'd join me in wishing you clear skies.

✱



# The RASC Virtual GA and GA Lite 2020

The pandemic forced the move of RASC's annual General Assembly (GA) to an online event for the first time in its history. As the 2020 hosts, RASC Vancouver Centre scrambled to transform the two full days of in-person speakers and activities into a diverse range of seventeen online talks: a Virtual GA and a series of "GA Lite" webinars held over three weekends in June. The more business-oriented Annual General Meeting (AGM) was hosted online by RASC National later in the day on the same Sunday, June 7th as the Virtual GA.

## What Happened at the Virtual GA

The RASC Virtual General Assembly (GA) was held on June 7, 2020. It was a huge success with over 200 attendees for the 3-hour live stream on YouTube that generated enthusiastic comments like the following:

*"Thank you to the Vancouver RASC for a great afternoon of talks! I would have traveled to Vancouver*

*to see them!"*

*"My friend suggested that I check this out...what an amazing way to spend a Sunday afternoon. I even got Sara's the 2 Is this a planet? questions right! Great program."*

*"It was about as perfect as could be Thanks Vancouver Centre!"*

The video recordings in the RASC Vancouver YouTube GA playlist at <https://www.youtube.com/playlist?list=PLp4p--2i2yDC8xWh-Hq9Jx56jeJolu9WdS> are now among the most popular RASC videos with over 1100 views to date.

The event kicked off with youth members and GA organizing committee members Marina and Meredith Miller reading a beautiful letter (page 8) from RASC's viceregal patron, Her Excellency the Right Honourable Julie Payette, currently the Governor General of Canada and a former Canadian astronaut. David Seaweed, the Indigenous Student Services Coordi-

by RASC Vancouver GA Committee

nator at Douglas College, followed with a video welcome message that included some First Nations perspective and stories related to astronomy.

CSA Astronaut Joshua Kutryk, who completed his astronaut candidate training in January 2020, spoke to approximately 20 youth in an intimate Zoom meeting that was streamed live on YouTube. Joshua had been CapCom on the previous weekend for the historic SpaceX Crew Dragon launch and shared some of his thoughts on the importance of that mission. He included behind-the-scenes photos and told his story of why he became an astronaut. Five lucky youth were able to ask him questions ranging from life in the solar system to astronaut training.

Next was a fascinating talk by Professor Sara Seager, a Canadian-American astronomer and planetary scientist known for her work on extra-solar planets and their atmospheres. Sara gave an engaging update on the

continued on page 7

## Membership has its Privileges!

Are you tired of looking at the same objects again and again (planets, moon, etc.)? Is your telescope collecting dust because it's hard to locate deep sky objects? Would you like to bring your observing to a stellar level? Robert Conrad, our new observing director, revived the Vancouver RASC observing group and invites you to join by sending him an email at [observing@rasc-vancouver.com](mailto:observing@rasc-vancouver.com). Some of the benefits of belonging to this group include:

- Hands on training on how to operate the SFU Trottier observatory
- Weekly observing sessions at the observatory or at dark sky locations
- One-one-one coaching on how to locate thousands of objects in the night sky
- Attend small interactive seminars delivered by Robert on a range of topics including failsafe star-hopping, charting challenging objects and understanding the motions of the cosmos
- Learn to make your telescope dance by locating objects such as asteroids, nova, and supernovae
- Spectroscopy and imaging training from Howard Trottier and an opportunity to collaborate on observatory research projects
- Updates on observable sky events happening during the week like asteroid/comet/deep sky conjunctions
- Access to observing guides and lists that Robert created that took hundreds of hours to create and will help with planning observing sessions
- Knowledge and expertise from other observing group members
- Learn how to quickly and efficiently find and star-hop to deep sky objects using a range of binoculars and telescopes

# Upcoming Events

## August

Merritt Star Quest CANCELLED  
Mt. Kobau Star Party CANCELLED

## October

16 - 18 – Manning Park Dark Sky  
Festival

## December

10 – AGM

continued from page 1

ups and downs of the gig economy and the tech industry in the Lower Mainland. He worked for eight years starting in 1999 at Alpha Technologies in Burnaby. In 2015, he started work at Star Solutions in Burnaby, where he worked for the rest of his life. There, colleagues valued his writing for user guides.

While Barry was Speaker Coordinator, he drew many speakers from the Vancouver area such as UBC astrophysicist Jaymie Matthews and John MacDonald, founder of Canadian space contractor MacDonald Dettwiler and Associates (MDA).

Armed with the Centre's speakers' budget, Barry was able to attract speakers from the U.S., including

Carolyn Porco, the Imaging Team Leader for the Cassini spacecraft that flew to Saturn, John Mather, the winner of the 2006 Nobel Prize for Physics, and on several occasions, Ray Villard, the News Director for the Space Telescope Science Institute, home of the Hubble Space Telescope.

One of Barry's favourite speakers was Philip Klass, an *Aviation Week & Space Technology* editor who was one of the world's top skeptics of UFO sightings. Klass managed to draw a full house when he spoke to the Vancouver Centre in June 1994, even though it was the same night the Vancouver Canucks played in Game 7 of the Stanley Cup finals.

There was no conflict that night for Barry, who wasn't a hockey fan.

He enjoyed watching Blue Jays baseball with his late mother Dorrie, but above all, he was a fan of the National Football League. Every Sunday in the fall he enjoyed cheering for the Seattle Seahawks and any team that was playing the Oakland/Los Angeles Raiders.

Barry first became interested in space while following the Apollo lunar landings in his youth, and later he kept close track of space programs the world over. That ultimately drew him to astronomy and the Vancouver Centre. He also enjoyed making models of spacecraft, and he built up a collection of science fiction movies.

He was also known for his unique sense of humour, which was anything but politically correct and was often expressed in the form of barbed comments about politicians of all political stripes and at all levels, including people who stood for office in the RASC.

He leaves behind many friends in the Lower Mainland and in the world of space science, along with a brother, a sister and a niece. ✨

*Chris Gainor was a member of the Vancouver Centre from 1992 through 1996. He became a friend of Barry's during that time and served as Nova editor in 1996. Since then he has been a member of the Victoria Centre. Chris served as RASC National President from 2018 to this year, much to Barry's disapproval.*



Barry (left) in 1993 with Jim Bernath (centre), Chris Gainor (right) and Ken Harmon (top)

continued from page 5

“Transiting Exoplanet Survey Satellite” (TESS) mission. TESS is the next step in the search for planets outside our solar system. Sara’s talk showed attendees how the pattern matching ability of their human brains can augment computer algorithms in looking for dips in a star’s light curve. These dips suggest that a transiting exoplanet may have crossed the star’s face.

We were grateful to have one of Canada’s best-known science journalists, Bob McDonald, join us to complete the program. His talk, “What if Everything We Know is Wrong,” was a historical look at how science has changed our view of the universe, demonstrating that the way we see it with our five senses is wrong. We believe you Bob—there is still a great deal we haven’t figured out! Bob’s ability to engage with the audience was apparent in the Q&A session that followed his talk.

RASC Vancouver toques were presented as gifts to each of the speakers and two door prizes were awarded to attendees. Dave L from Halifax won an SQM-L sky quality meter donated by Unihedron, and Terry B from the Okanagan won an astrophoto donated by Matthew Cimone.

### What Happened at the GA Lite

Fourteen additional talks were given as part of the “GA Lite” series of webinars on the following two weekends, June 13th & 14th and 20th & 21st. Most talks were just 30 minutes which kept the webinars focussed and quick moving. The recorded videos can be viewed via the GA Lite playlist at <https://www.youtube.com/playlist?list=PLp4p--2i2yDBtDa->

C6EpYVx1VNwuAltCCh

The June 13th GA Lite 1 webinar featured talks from RASC members living on the west coast. Ian McLennan gave a fascinating account of his career working at some of the best-known planetariums in the world and an update on some new projects. Marina Miller informed attendees of simple steps that Centres can take to reduce the environmental impact of their activities. The mixing of social causes and science is a key part of Matt Cimone’s life and was a key theme of his talk where he explained how diamonds connected his charitable work in Sierra Leone with his love of space and astronomy. Charles Ennis showed a variety of small observatories used and built by amateur astronomers.

Three talks with different themes were presented at GA Lite 2 on Sunday, June 14th. Chris Gainor, Randall Rosenfeld, and Peter Broughton talked about why we should be knowledgeable in the history of astronomy. Satellite mega-constellations, such as SpaceX’s Starlink satellites, are a timely topic and Fraser Cain described their impact on astronomy and difficulties in mitigating that impact. The LivingSky Guy, Tim Yaworski of RASC Saskatoon, ended the session with an introduction to DSLR astrophotography that included equipment, techniques, and many beautiful examples.

GA Lite 3 on June 20th was largely a UBC science affair with two professors and a recent PhD. The session started with Aaron Boley speaking about the issue of space debris and national/international policies regarding debris. Jess McIver talked about one of the newest and most exciting advances

in astronomy—gravity waves and how gravity-based astronomy differs from light-based astronomy. Michelle Kunitomo developed the expertise for her talk on exoplanets by discovering 17 potential exoplanets while an undergrad at UBC. Michelle continued researching exoplanets in her graduate work and passed her PhD defence on June 17—just four days before her GA lite talk—congratulations Dr Kunitomo! The non-UBC contribution came from RASC Vancouver’s Scott McGillivray who described how his regular Global TV segment on space and astronomy came about and shared tips on how to appeal to a wide audience of TV viewers.

GA Lite 4, our final webinar on June 21st, began with a practical observing talk from RASC Vancouver’s Robert Conrad and Andrew Krysa. Sharon Odell covered the historical significance of the Dominion Observatory in Ottawa, which opened in 1905, and the work being done to preserve and restore it. Kurtis Baute’s talk started with how he measured the circumference of the Earth using sundials while biking in Saskatchewan and ended with a focus on climate change and the observation that the Earth is small compared to its ability to sustain us all.

We would like to thank all the speakers, hosts, attendees, sponsors, and volunteers for making the event a great success. Despite the challenges of physical distancing, the Virtual GA and GA Lite enhanced the connections between a diverse audience of astronomy enthusiasts from across Canada to reinforce Helen Sawyer Hogg’s message that “*The Stars Belong to Everyone.*” ✨





THE GOVERNOR GENERAL • LA GOUVERNEURE GÉNÉRALE

**Message from the Governor General of Canada on the occasion of the  
RASC Virtual Assembly 2020**

Space may be the final frontier for astronauts and Starfleet captains, but for most of us Earthlings, space is only accessible through the lenses of a telescope. Fortunately, these days, the night sky is easy to observe with even basic instruments. The stars belong to everyone!

For more than 150 years, the Royal Astronomical Society of Canada (RASC) has supported astronomers across the country, young and old, encouraging them to look beyond the horizon. Through activities and educational programs, the RASC reminds us how much fun astronomy is—and how the vastness of space can bring us together, even when worldwide challenges force us apart!

At today's virtual assembly, you will have the chance to further your knowledge and to interact with some very well-informed experts. Among others, you will hear from my fellow Canadian astronaut, Joshua Kutryk—don't be shy to ask him the really tough questions and don't forget to say hi from me!

If you are curious about the Universe or dream of boldly go where no one has gone before, this is the place for you. And remember to look up! You never know what you might find, out there in the stars.

Live long and prosper!

1 SUSSEX DRIVE • 1, PROMENADE SUSSEX  
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# Memories of Barry

by Scott McGillivray

Each of us has fond memories of our friend Barry Shanko; I'd like to share a few of mine. Barry was the first RASC member I met at my first Thursday lecture night. It was September 10, 2009 at the Planetarium and Barry stood out from everyone. He wasn't a famous astronomer, but he was on a first name basis anyone who was.

I joined council in 2011 and it was always exciting to hear from Barry at the board meetings, the many big names he had spoken with and our upcoming guest speakers. Barry had a unique talent for reaching people in high places, somehow convincing senior researchers at NASA and the NRC to visit Vancouver and speak at our events. When

RASC left the Space Centre in 2012, I began driving Barry home to save him the hassle of returning to Marpole via TransLink. I'd look forward to our conversation as much as the monthly lecture. Nobody I knew was as informed as Barry in current space and astronomy events.

In late 2016, Barry's health forced him to officially leave the role of Speaker's Chair, which I took in 2017. I figure it was a year before I booked my first speaker. Barry was always behind the scenes filling the calendar with guests. While I'd stress for weeks about calendar slots, Barry could whip up emails to the right people and the next day we'd have a Nobel Prize recipient ready to visit Vancouver. I took the role

to meet celebrities... big names like Linda Spilker, William Borucki, Nancy Chabot, Sara Seager, and Bob McDonald. Barry brought them to Vancouver, I just picked them up at the airport.

Many of you will agree our monthly lecture nights are the highlight of what we do at RASC Vancouver. It was always Barry's work. My inbox has about a hundred emails from barryshanko@telus.net. About twice a month he'd send a link from a science journal with something like, "I've been speaking with this research team, should we ask them to come visit?" On those emails alone Barry has given us enough content to keep the lecture nights going for years. \*

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continued from page 2

radiation, etc. are all synchronized in some way with these magnetic changes. There are many reasonable theories, but we have limited factual knowledge about what happens inside the Sun. The eleven-year cycle has been observed for many centuries (the last 400 years are quite well documented).

Over the last 10 years, NASA's Solar Dynamics Observatory, in a geostationary orbit around Earth, has collected around 425 million gigabytes of data (one image every three quarters of a second, according to NASA). This effort has contributed much to an increased knowledge of how the Sun interacts with Earth, and the solar system.

Here is an excerpt from Wikipedia:

## Solar cycle

The solar cycle or solar magnetic activity cycle is a nearly periodic 11-year change in the Sun's activity measured in terms of variations in the number of observed sunspots on the solar surface. Sunspots have been observed since the early 17th century and the sunspot time series is the longest, continuously observed time series of any natural phenomenon. Accompanying the 11 year quasi-periodicity in sunspots, the large-scale dipolar magnetic field component of the Sun also flips every

11 years, however, the peak in the dipolar field lags the peak in the sunspot number, with the former occurring at the minimum between two cycles. Levels of solar radiation and ejection of solar material, the number and size of sunspots, solar flares, and coronal loops all exhibit a synchronized fluctuation, from active to quiet to active again, with a period of 11 years. This cycle has been observed for centuries by changes in the Sun's appearance and by terrestrial phenomena such as auroras.

If you have appropriate equipment—proper solar filters for

continued on page 10

continued from page 9

your general-purpose telescopes—or if you follow the rules of projecting the Sun onto a screen, you may want to check for the visible state of sunspots over the next years. **WARNING:** *Never look at the Sun directly without correct filters through telescopes, binoculars, or even the naked eye. Damage to the eye, possibly including blindness, can be a result, either instantly or as vision problems later in life.*

Solar observations and photography are a great way to do astronomy—you can have your regular sleep hours; no need to stay awake for much of the night. There is much information about the Sun (and its effects on the Earth) in the RASC's *Observer's Handbook* (starting on page 184 of the 2020 edition). Try it, you might like it.

★



The Sun in H-alpha light

## Thanks to Our GA Lite Speakers



## Members' Gallery



### **Venus and Pleiades Conjunction** by Gordon Farrell

The April 3, 2020 conjunction of Venus and the Pleiades as seen from my Vancouver roof deck a bit before 9pm. The overexposed Venus is an oval rather than a circle due to the phase of the planet, which was roughly 50% at the time. A 0.6sec exposure at f/4 and ISO 5000 at 200mm using my Canon 5D Mark IV.



### **Saturn, Moon, and Jupiter Conjunction** by Gordon Farrell

An image from this past Sunday, July 5, 2020 of the conjunction of Saturn (upper left) the Moon (centre) and Jupiter (upper right) from Vancouver at 11:30pm. A composite of two images shot at different exposures to capture the very bright Moon and the relatively dim planets. The Moon was a 1/30sec exposure and the planets were a 1 sec exposure. Both images were f/16 at 800 ISO using a 70-200mm lens at 140mm on a Canon 5D Mark IV. The inset at the lower right is a close-up of Jupiter showing the moons (left) Callisto, Europa, and (right) Ganymede.