NOVA

NEWSLETTER OF THE VANCOUVER CENTRE RASC

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Paul Sykes Lecture – Fri, Feb 21 @ 7:30pm

40 Years of Astronomy at the Top of the World

Mary Beth Laychak, Dir. of Strategic Comms at the Canada-France-Hawaii Telescope

SFU Burnaby Campus, Room SWH 10081

On Friday, February 21, 2020 at 7:30 pm, please join us at SFU Burnaby Mountain for our annual Paul Sykes Memorial Lecture. The lecture hall location is still being finalized so closer to the date, please go to our website at www.rasc-vancouver.com or to our Meetup page for that detail.

This annual lecture is held in memoriam of Paul Sykes, who passed away in October of 2005. Paul was an RASC Life Member and avid supporter. Upon his passing, he bequeathed a substantial sum that has kept your Vancouver Centre financially solid for the last 15 years.

Paul was born in Hummelston, Pennsylvania, USA in 1918. He was interested in astronomy at an early age. During his teens, he published his own monthly astronomical column. He was an officer in the United States Air Force, served in the Pacific during WWII, attaining the rank of captain. Following the war, Paul

attended UBC in 1948, earning a degree in physics. He rejoined the U.S. Air Force and attended the Oak Ridge School of Reactor Technology, studying nuclear physics. He worked on the NERVA Project, a nuclear rocket development effort. Thereafter, Paul returned to BC and was appointed a lecturer and administrator in Physics at UBC. He remained there until retirement in 1983.

In honour of Paul Sykes, we have invited as speaker Ms. Mary Beth Laychak, Director of Strategic Communications at the Canada-France-Hawaii Telescope.

The title of Ms. Laychak's presentation will be "40 Years of Astronomy at the Top of the World."

Synopsis: 2019 marked the 40th anniversary of the Canada-France-Hawaii Telescope. I will share stories of the science, staff, and their adventures over those 40 years along with plans for the future.

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JANUARY 9	FEBRUARY 13	MARCH 12
SFU	SFU	SFU
Anna Hughes of UBC will present her research on magnetic fields around dwarf stars. Room SWH10041.	Speaker TBA. Watch Meetup for updates. Room SWH10041.	Alan McConnachie of the Dominion Astrophysical Observatory. See Meetup for details. Room SWH10041.
SFU	SFU	SFU

Members' Gallery

Touring the Canada-France-Hawaii Telescope (CFHT) by Hayley Miller

Over the holidays, Hayley visited CFHT headquarters on the Big Island of Hawaii where she had a chance to meet Mary Beth Laychek (upper left) who will be our upcoming Paul Sykes speaker this February. The upper right shows staff member Simone hard at work collecting data and at the lower left is a scale replica of the CFHT telescope itself.

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Bio: Mary Beth Laychak is the Director of Strategic Communications at the Canada-France-Hawaii Telescope on the Big Island of Hawaii. She also runs the Maunakea Scholars program, an innovative astronomy outreach program for Hawaii public high school students. Mary Beth has an undergraduate degree in astronomy and astrophysics from Penn State University and a masters degree in educational technology from San Diego State. Her passions include astronomy, sharing astronomy with the public, astronomy based crafts, and running. She lives in Waimea, Hawaii with her husband and cat. ✸

President's Message

by Gordon Farrell

This past September, my partner and I were invited to spend a few days at a seaside cabin owned by some friends of her's. It was an epic journey that saw the six of us travelling up the Sunshine Coast to Earl's Cove then hopping into a water taxi for the last leg of the trip along with all of our supplies so we could survive off-the-grid until the water taxi returned to take us back to civilization in five days' time.

While I had considered bringing my small scope along, there was already so much to be packed (between food, clothing, bedding, and other necessities) that I decided to leave it behind. Besides, the forecast was questionable so there was a good chance it would have made the trip for nothing. The first day and night definitely lived down to expectations with rain pounding the roof of the cabin and sizzling on the ocean just beyond the front porch. But we were still away from the city and all of its expectations and distractions, which was the important thing.

One of the joys of this life is the

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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 necessarily 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 Trottier 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
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Past President	Leigh Cummings
At Large	Howard Trottier, 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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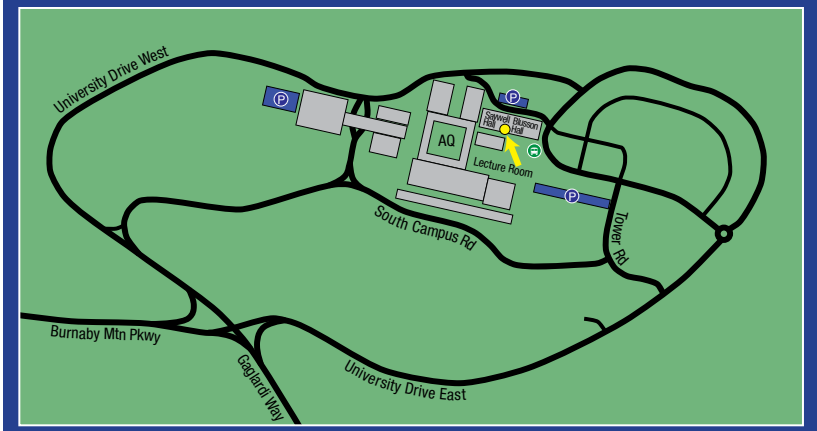
PO Box 89608
9000 University High Street
Burnaby, B.C.
V5A 4Y0

Map to Meeting Site



Our Jan-Apr meetings are in room SWH10041 of Saywell Hall, about halfway down the main corridor as indicated by the arrow on the map.

Pay parking is available at several locations located around campus (indicated as "P" on the map).

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sharing of knowledge, both learning from others and passing along what we know in return, and this trip provided many such opportunities. Our hosts, prior to their retirement, had both worked at a medical school in the Caribbean and had many tales to tell of tropical life on the tiny island of Saint Martin. The other couple are biologists and knew all about the flora and fauna around us, including some tasty information about licorice ferns. And my partner continued in her efforts to teach me the proper way to use a kitchen, this time in the form of scones from scratch.

My chance to share came when it cleared up on the third and fourth nights. Walking out to the end of the dock with a pair of binoculars they had in the cabin, I began the tour of the heavens for my small audience. The cabin faces southwest so the Milky Way rose up from the hill behind us before arching over the bay with the centre of the galaxy attached to the mountains on the far side. Sagittarius was an easy target in that direction, as were Cygnus and Lyra straight overhead. Looking back towards the cabin, Hercules, Polaris and the Big Dipper were visible to the left while Pegasus was rising over the mountains to the right, which put M31, the Andromeda Galaxy, in easy reach of the binoculars. All this was new to four of our companions, who were amazed by the scope of what could be seen with the unaided eye. And to complete the circle, an oar from one of the canoes tied to the dock was a handy tool for stirring up the bioluminescent algae and their blue-green glow.

The new year brings with it a new council for RASC Vancouver featuring most of the same faces as last year with a few of us in new roles, including myself. We also have the 2020 GA coming up in June, the first to be hosted in Vancouver since 2003 (you'll find an article with the latest updates about the GA on page 5). We're still looking for volunteers to help with the GA so if you'd like to help out, please contact Hayley Miller, the chair of our GA Committee, at events@rasc-vancouver.com.

We look forward to continuing to share knowledge about the universe in 2020. We hope you'll join us! ✸

Your 2020 RASC-Vancouver Council

GA Update

by Marina Miller

As you may know, RASC Vancouver Centre is hosting the RASC 2020 General Assembly from June 5th-7th. We are planning an exciting series of talks, presentations, speakers, and public outreach activities. Speaker highlights include Bob McDonald from CBC's *Quirks and Quarks*, UBC Researcher Aaron Boley, Astrophysicist Jess McIver and many more!

All of these events will happen at the Executive Plaza Hotel & Conference Centre in Coquitlam B.C. The public Helen Sawyer Hogg lecture will take place at Simon Fraser University, where guests can also visit the amazing Trottier Observatory.

We are planning this GA through an intersectional lens to highlight the diversity of people interested in Astronomy and science outreach. There will be an entire day focused on youth activities, and the GA will kick off by acknowledging that it takes place on unceded traditional indigenous territories. We also want it to be environmentally friendly, so we will provide tips on how to "keep it green" at the GA, including a talk from one of our youth members.

Early bird registration is now open! https://ga2020.rasc-vancouver.com/registration-eventbrite/

Also keep an eye out on the GA Website for all the details: https://ga2020.rasc-vancouver.com

We hope to see you at the GA. ✸

RASC GA 2020 VANCOUVER

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. 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

February
21 – Paul Sykes lecture at SFU (see page 1 for details)

March
21 – Night Quest at Pacific Spirit Regional Park

May
9 – Astronomy Day at SFU

June
5 - 7 – RASC General Assembly in Vancouver

August
15 - 23 – Merritt Star Quest
15 - 23 – Mt. Kobau Star Party

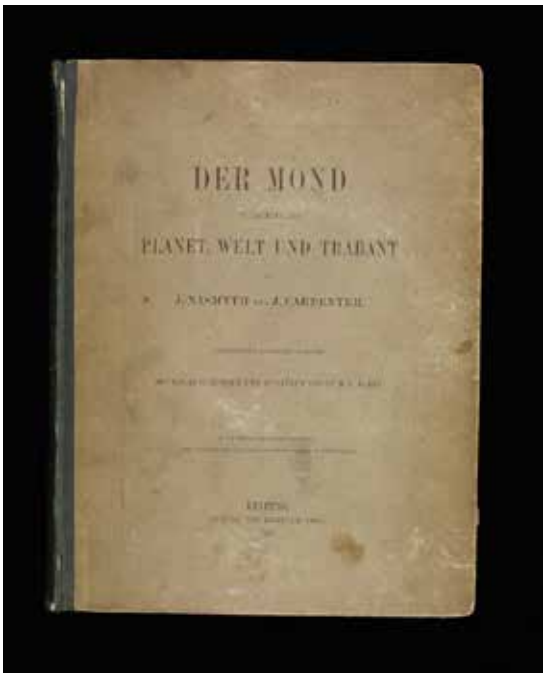
September
TBD – Manning Park Dark Sky Festival

December
10 – AGM

My Start in Astronomy

by J. Karl Miller

This article begins with a part of my life which is germane to this story. I was born in Berlin about three months before the start of World War II. My father was conscripted into the war effort; military duty was mandatory. As a result, I saw very little of him and I have only sporadic memories of the occasions when he was on furlough. I remember the end of the war more clearly—being subject to the evacuations and bombings tend to sharpens one's mind. My father was taken prisoner of war in Russia at that time and I did not see him for about two years. When he came home in 1947, he was a very sick man and went straight into the hospital. I visited him many times during his stay there. On one of these visits he showed me a book he was reading. It was the German translation of a book about the Moon and the craters on it. The English title is: *The Moon, Considered as a Planet, a World, and a Satellite*. The authors are James Nasmyth and James Carpenter. The book was published in 1876.



At that time, the origin of lunar craters was still a subject of contention: either by volcanic activity or by meteor impacts (this question was finally resolved in the 1960s and, except for a few volcanic features, impact is the answer). My father showed me a picture of a lunar crater in that book; the picture actually showed a plaster of Paris model, made by the authors to show the lunar craters' volcanic nature. That picture has been in my memory ever since, as well as the title of the book, and its authors. The picture (see below) was the start of my interest in Astronomy; I don't know why it made such an impression on me. The book is actually my last memory of my father—he died a couple of months later. Nowadays, antibiotics would have saved his life, but they were non-existent at that time, especially not in war-torn Berlin.

I subscribe to *Sky and Telescope* magazine. The December 2019 issue includes an article by Klaus

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Star Charts and Atlases

by Andrew Krysa and Robert Conrad

There are a variety of star charts available to purchase including two popular books of star charts called *Sky Atlas* and *Uranometria 2000.0*. These, however, are pricey and some are no longer published. Also, these atlases usually don't show stars of lower magnitudes that many medium sized and larger telescopes can see. *Uranometria 2000.0* only shows stars up to a magnitude of 9.75 and *Sky Atlas* only shows stars up to magnitude 8. This is an important point to consider because you may have a telescope that allows you to see stars up to magnitude 13 or 14 and using a chart that shows fewer stars than you see in your telescope can be confusing. You want to match the star chart you're using with the limiting magnitude power of your telescope as closely as you can because in either case when you have more or fewer stars on your chart than what you actually see in the eyepiece it can be bewildering and disorienting. We have especially seen many beginners struggle with this discrepancy between what they see on the chart and in their eyepiece because they're taking the chart literally and expecting to see something in the eyepiece that is there or not there exactly how it appears on the chart. The problematic fact that these atlases only go up to a magnitude of 8 or 9.75 can be further intensified when you are navigating your way through areas of the sky that have very few stars and you may find yourself in a situation where you may not have any dimmer recognizable star patterns or stars to navigate with on the chart. These star atlases may not include some fainter objects still visible in some telescopes. Atlases also don't include objects such as asteroids, comets, newly discovered novae or supernovae which you will want to chart as they occur and become visible in the night sky. A problem with atlases is that it isn't really desirable to mark them up constantly with new objects you may want to observe. However, these atlases can be good for beginners with lower power telescopes who want to explore the major "wow factor" objects one can observe and also for the very experienced observer who will not take the atlas charts too literally and realize that not all the stars they see in their telescope are shown in the atlas.

There is another sky atlas which is indispensable for identifying and learning constellations and the stars that are connected within them. This is the *Pocket Sky Atlas*. Everyone should have one of these when they are out observing and trying to locate where certain constellations are, where certain stars are and where possible objects you might want to search for are located. A good idea would be to take the *Pocket Sky Atlas* out on occasion even without a telescope or binoculars just to study the sky and learn your constellation shapes and locations. This atlas also has a good scale for binocular viewing. As a beginner you should create a field of view circle on a small piece of acetate that represents your binocular true field of view or angular field of view with the scale of the sky atlas book charts. Your binocular true field of view is usually written on the side of the binoculars and is somewhere between 3° and 6° for most types. The scale of the *Pocket Sky Atlas* charts is 1°, equal to 6.2 millimetres. So for a pair of binoculars with a field of view of 3.5° you would multiply 3.5 by 6.2 which would give you a circle with a diameter of 22 millimetres that you should draw on your piece of acetate. Then if you place your acetate binocular field of view circle, for example, on the star Mizar in Ursa Major on the *Pocket Sky Atlas* chart number 43, you should compare the stars that you see in that field of view circle with what you see in your binoculars as an important first step in star hopping. If you look in the telescope eyepiece to compare what you see on the chart in the field of view circle, you will see not only Mizar but its optical double Alcor along with some other bright stars and star patterns. You could then use your field of view circle to navigate to the next bright star in the handle of Ursa Major known

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as epsilon Ursa Majoris or Alioth. Once you are there you will also find the second brightest star in that field of view known as 78 Ursa Majoris which happens to be a fine looking double star (which only really appears double in telescopes). Even with binoculars, before we move from Alcor/Mizar to Alioth we need to ensure that we have oriented the chart in the correct manner. Depending on what season or time of night it is, we may need to move our binoculars up, down or to the left or right. As it rotates counterclockwise around the stationary star Polaris (or the North Star), Ursa Major may appear tipped on its side with either the handle facing down if it's to the right of Polaris or with the bucket facing down if it's to the left of Polaris or straight on and upside down if its directly above Polaris or straight on right side up if it's just below Polaris (or any other orientation in between these four points).

It is worth mentioning here that you should probably familiarize yourself somewhat with the Greek alphabet so you can recognize the labelling of stars on star charts. Most stars are designated by Greek letters in alphabetical order of brightness in the constellation that they reside. Alpha is for the brightest, Beta for the second brightest, Gamma for the third brightest, etc. followed by the Latin possessive or genitive form of the constellation they are in, for example Geminorum or Aquarii instead of Gemini or Aquarius. We see names like Alpha Aquarii or Tau Ceti in the constellation Cetus designated by their Greek letter on star charts so a knowledge of the Greek alphabet is indispensable when reading star charts. Some of the brightest and more recognizable stars also have their own proper names as well as their Greek designation like Vega (also known as Alpha Lyrae as it is the brightest star in the constellation Lyra). Fainter stars and less well known ones usually have a numbered designation in several different cataloguing systems.

α	A	alpha	β	B	beta	γ	Γ	gamma
δ	Δ	delta	ε	E	epsilon	ζ	Z	zeta
η	H	eta	θ, ϑ	Θ	theta	ι	I	iota
κ	K	kappa	λ	Λ	lambda	μ	M	mu
ν	N	nu	ξ	Ξ	xi	o	O	omicron
π, ϖ	Π	pi	ρ	P	rho	σ	Σ	sigma
τ	T	tau	υ	Υ	upsilon	φ	Φ	phi
χ	X	chi	ψ	Ψ	psi	ω	Ω	omega

The Greek Alphabet

We discovered a few years ago a set of star charts called Triatlas charts which were available online for free that met all of our observing needs. The star charts include stars up to magnitude 13 which at the time matched my telescope's limiting magnitude almost perfectly. Also they were a perfect scale for drawing my field of view circles. In addition to that they also contained many, many more deep sky objects than any other atlas in publication. What was also nice is that they were in PDF format and could easily be printed and marked on and then recycled when they became too marked up or ruined by dew (a common enemy of the amateur astronomer). These charts also came in three different scales. The A scale charts were great for naked-eye observing and constellation identification. In fact, you can very easily use these A charts as you would the *Pocket Sky Atlas* to identify constellations, stars and objects of interest when you are out in the field and the nice thing is that they are free. The B charts were a perfect scale for drawing a binocular field of view. The C charts were most appropriate for telescope eyepiece field of view circles.

Let's explain how the C charts work. If you would like these charts we will send you the links—simply email us at observing@rasc-vancouver.com You'll notice that there are 570 pages

of C charts alone, which cover the entire sky including northern and southern hemispheres. You can print up single pages or as many pages as you need for your star hopping or observing needs whenever you like. All of the Triatlas charts, whether they are A,B or C, contain a key that shows a pictorial representation of all the constellations and the chart numbers and is in the form of a grid. So if my object is near the star Betelgeuse in the constellation of Orion, then I would look at the key and locate the constellation Orion on the key and see that the top right star in Orion, which is Betelgeuse, is on C chart C251. This is one example where it helps knowing your constellations well. How they are shaped, which stars they contain and where they are located in respect to other constellations is very important. You will notice that the chart pages are associated in such a way that they are connected by the corners and sides and top and bottom to adjoining chart pages. You will see little black boxes in the corners and around the chart which contain the C chart numbers of adjoining chart pages. For example, if I wanted to navigate from Betelgeuse to the star Bellatrix (also in Orion) I would need the adjoining chart C252 to continue on my star hop. Alternatively if I wanted to navigate to the open star cluster M35 in Gemini from Betelgeuse you can see that I would need chart C203 to continue star hopping.

The Triatlas charts match the orientation that you would see in any star atlas. One of the extreme benefits of using these charts is that if you have a telescope configuration (as many people do) that creates what's known as a "horizontal flip" or "mirror image" you can easily use software or your printer driver to print them out in this different orientation so they will match what you see in your telescope. The disadvantage of using *Uranometria* or *Sky Atlas* is that they don't publish their star charts with this mirror flipped orientation. This is key because there is no way that you can hold your star atlas or chart to match this type of orientation unlike simply turning it upside down or sideways for a reflector telescope. Many telescope companies will include an accessory called a star diagonal which allows for more comfortable viewing by not requiring you to bend or kink your neck when looking through the telescope but creates this inconvenient mirror flip orientation/view. It is strange that telescope manufacturers would include this sort of accessory but do not instead include an accessory which only costs a fraction more than a star diagonal called an erecting prism that does the same in allowing for more comfortable viewing but which shows a correct orientation (no mirror flip) when looking through it.

The C charts also contain a legend at the top of the chart that shows different deep sky objects represented by different symbols. For example, globular clusters appear as a circle with a cross in them. The brightest globular cluster in the northern hemisphere, M13 in the constellation Hercules, is shown on chart C139 or C99. The reason M13 appears on both charts is because M13 appears near the top of page on C139 and near the bottom of chart C99 and all of the charts have some overlapping in all directions—top, bottom, sides, corners—or in other words overlapping right ascension lines and declination lines. The legend also contains a magnitude scale from bright -1 to a faint 13. You'll notice that the larger the circle is, the brighter the star is and the scale shows the different sizes and their corresponding magnitudes. You will also notice the abbreviations for the constellations on the chart pages. For example on chart page C264 you will see PSC which represents the constellation Pisces and AQR which represents the constellation Aquarius. The charts do show the constellation boundary lines between the 88 official constellations but also show the lines that connect the stars within the constellations so be careful not to confuse these lines which look similar. If you look at star chart C221 you can see the boundary lines between Pegasus (PEG) the winged horse, Delphinus (DEL) and Equuleus (EQU) but the chart also shows

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the lines connecting the brighter stars in the constellation Equuleus, the small horse, and part of Delphinus, the dolphin.

The chart pages are organized in such a way that they go in descending declination order. If you remember, declination and right ascension on the night sky are similar to latitude and longitude on the Earth's surface. So on chart page C1 you will find declination +90° and on the last chart page C570 you will see declination -90°. The declination lines appear vertically along the sides of the chart pages in 1° increments. The right ascension lines appear horizontally at the bottom of each chart page. On chart page C1 the 0 hour 0 min line appears at the middle of the bottom of the page and goes in one hour increments. As you spiral down in declination, the charts can go down to either 5 or 10 minute intervals. So as you go from chart page C1 to chart page C570, the charts essentially spiral downwards from the north celestial pole to the south celestial pole, covering the entire celestial sphere. Let's say we want to find the gorgeous ring nebula in the constellation Lyra the harp which is located at declination 33° 1 min 45 sec and RA 18 hrs 53 min 35 sec. You would first go to the key included in the Triatlas C set charts and locate where the constellation Lyra is. You will notice that this constellation is covered by charts C96, C97, C135, and C136. If you look at the *Pocket Sky Atlas*, you will notice that M57, the ring nebula, is between the bottom two stars of Lyra so these two stars are located on Triatlas chart page C135. In this case, the starting star for your star hop to M57 would be either beta or gamma Lyrae. This is nice because your starting star is on the same page as your object so you only have to print out one page and the star hop isn't too far from either star.

You will need to draw a field of view circle around the starting star you pick which will represent what you see in your telescope wide angle eyepiece, ideally between a 24' and 30' eyepiece. If your wide angle eyepiece field of view for your telescope is for example 1.5°, which is pretty average (you can figure out how to calculate this from many resources online or see our article on star hopping in the previous NOVA edition for November, 2019) then you can draw a circle on the C chart. On the C charts, 1° is equal to 20 millimetres. So a 1.5° view in your telescope eyepiece would be represented on the C chart by a circle 20 × 1.5 millimetres, which is a circle 30 millimetres in diameter. Draw this 30 millimetre circle centred on your starting star and then you should orient the start chart to what you see in the eyepiece. Usually with refractor telescopes you would start by turning the page upside down and then adjusting left or right from there. If you would like to draw consecutive circles all the way to your destination object, then feel free to, especially at the beginning of learning star hopping as it makes it easier to reference what is in the circle on the chart to what is seen in your eyepiece.

Another advantage of the Triatlas charts is that they are quite detailed and include thousands of objects like double stars or small planetary nebulae that you can use as stepping stones along the way from your starting star to your target object. With other atlases, you would never know these objects are there and would pass over them without even noticing. Robert has created a binder that contains thousands of objects that are part of his regular observing list and has charted the paths to these objects using many of these "signpost" objects. This creates a rewarding experience because instead of just randomly jumping from star to star, he can take in many of these objects and enjoy them along the way to his target.

A great project is to print up all the chart pages of, say, all the Messier objects to start with and put them in order from M1 to M110 in a binder labelled "Messier objects." Then when you go out observing, you can have the binder for star hopping to or locating any Messier objects that might be visible that night. In a period from mid-March to early April, many people attempt a "Messier Marathon" when you can see most of the Messier objects of mid northern latitudes

in one night. This binder would be perfect for a Messier marathon and you can also find many Messier marathon events organized by astronomy groups in your area. Later you may want to create other binders for, say, the Caldwell objects or specific objects like nebulae or double stars. A good thing to make up as you go along and learn more objects is a binder organized by constellations and what objects are visible in those constellations and their corresponding C chart pages and binder locations. This is where a good knowledge of what constellations are visible at what time of year and time of night is indispensable so you know which objects you are able to view or not view on any particular night you want to go out observing.

There are other objects that you won't find on any star charts that you might want to include in your observing sessions. These include objects that are either not always visible or are constantly moving like comets, asteroids, planets like Uranus and Neptune and dwarf planets like Ceres and Pluto. To chart these objects, you need to determine what the coordinates will be (i.e. right ascension and declination) for the approximate time you will be viewing them. There are a variety of resources available online to help you determine the coordinates of these objects and when they are visible from your location. Two of these resources are heavens-above.com and calsky.com as well as free downloadable simulation software like Stellarium. Also in a future article will be a complete guide to creating a special kind of star chart called an AAVSO (American Association of Variable Star Observers) which you use in conjunction with your C chart out in the field to find these transitory objects.

Note: If you would like these charts we will send you the links—simply email us at observing@rasc-vancouver.com ✸

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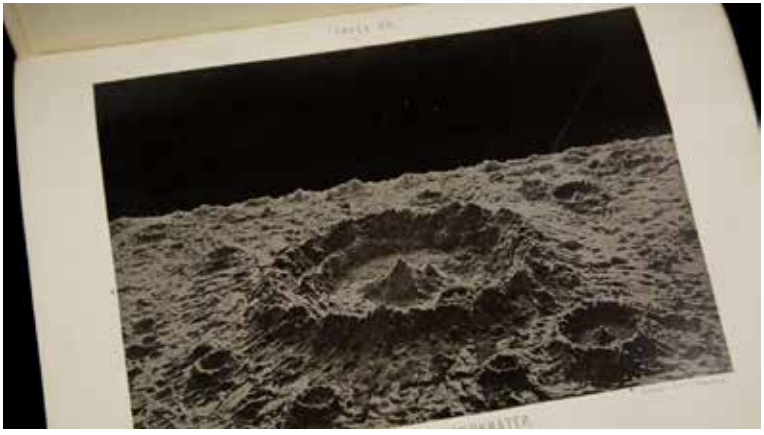
Brasch, professor at California State University in San Bernardino. The article is entitled "Just Over a Century Ago." In it, the book about the Moon I described above is mentioned, including the picture of the lunar crater that caught my original attention in 1947. I looked up Nasmyth and Carpenter on the internet, and immediately found a link to lynx-open-ed.org, which showed a dissertation on the two authors and their firm conviction of the volcanic origin of lunar craters, in the German version of their book. The book's title page and the lunar crater picture are shown below. Published in 1876, the original information in the translated text was already about 70 years old by the time I saw it.

Still an active member of the Vancouver centre of the RASC, involved in public astronomy days, using my telescopes, I never get tired of what the sky has to offer. Our current technologies have made astronomy into a science with connections to most other sciences—witness astrophysics, astrobiology, astrochemistry, quantum physics, computer science, geography and geoscience, space travel, etc. These connections often lead to interesting conversations with some of the people attending our star parties.

Professor Brasch's article certainly invoked a lot of nostalgia and makes me recount the many years I've enjoyed this hobby called Astronomy. ✸



Earthshine by Ken Jackson

The dull glow of Earthshine lights up the waxing Crescent Moon from sunlight reflected off the Earth's surface and back to the Moon. A bright Jupiter appears beside the tall tree, above and to the left of the Moon. Taken from Burnaby Mountain Park with a Nikon D5100, 2 sec exposure at *f*/5 55mm and ISO 400 on Oct 30th, 2019.