

# SKYNEWS



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## M33 The Triangulum Galaxy

By Dan Posey

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and **Galactic Rotation Curves**

## NEXT MEETING

Wednesday Oct 12th 2016  
At 7:30 PM  
Room A104  
Bob Wright Centre  
University of Victoria  
3800 Finnerty Road

[www.victoriarascals.ca](http://www.victoriarascals.ca)

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## On the Cover

### M33 the Triangulum Galaxy .....

By Dan Posey

M33, the Triangulum Galaxy, was obtained from two hours and twenty minutes of 20 minute unfiltered subframes. They were acquired in 2013 using a QSI583c through the VCO Televue 127mm with a focal length of 660mm. The incredibly low surface brightness of the galaxy combined with the Victoria sky glow made it challenging to reveal the outer boundary of this diffuse object. In August 2015 Dan experimented with ten different processing methods before achieving this beautiful result. Check out the article on M33 and Galaxy Rotation Curves on page 6.

## Presidents Report

by Sherry Buttnor

Welcome to September! Goodness...is it just me, or did summer go by really quickly?! Maybe it's because we had such a great time at the DAO and our other public events? In spite of some pretty sketchy weather early on, our Summer Saturday Star Parties at the Dominion Astrophysical Observatory were very popular once again. So popular, in fact, that we even had a problem with someone scalping our tickets. LOL...you know your efforts are successful when that happens! We even had a visit from the Lieutenant Governor of BC, the Honourable Judith Guichon. She was so impressed by our programs, she stayed over an hour longer than scheduled and pledged to return with her grandchildren. How about that?

Another major summer event was our annual RASCals Star Party in Metchosin. The first evening was absolutely stunning: clear and warm; the kind of evening we dream about all winter. The second evening was less impressive, with wind all afternoon replaced by clouds in the evening. In spite of that, over 70 people attended with many camping out the whole weekend.

And wrapping up our major public events, the Saanich Fair. Our booth at the Fair is always a hit with fairgoers. Here are some attendance numbers for you:

International Astronomy Day: 626 (daytime)

Saturday "star parties" at the DAO: 2221.

RASCals Star Party: 73.

Saanich Fair: ~1450.

Huge thanks to everyone who volunteered for these events!! You're amazing. Very special thanks to David Lee and Nelson Walker for their hard work

arranging and scheduling guest speakers and volunteers for the DAO evenings, and Lauri Roche for organizing the Saanich Fair weekend. Many thanks also to our friends at Friends of the Dominion Astrophysical Observatory, and Science Venture. Well done!

Here are links to some great photos of these events, taken by our members:

DAO Summer Star Parties: <http://rascvic.zenfolio.com/p109973364>

RASCals Star Party: <http://rascvic.zenfolio.com/rascals2016>

Saanich Fair: <http://rascvic.zenfolio.com/p717179212>

Just because those are over doesn't mean the fun is over. We're busy gearing up for all of our great regular activities for the rest of the year: regular monthly meetings and Council meetings at UVic with some terrific guest speakers, Astronomy Cafe with its laid-back atmosphere and great discussion topics, Cattle Point and UVic observing sessions (both scheduled to resume in October), and our Annual General Meeting on November 27th. Here's a schedule of upcoming events:

**General meeting Sept 14**, 7:30pm: Professor Sun Kwok, guest speaker. (room A104, Bob Wright building, UVic) Everyone welcome.

**DAO STAR PARTY Sept 24**...one last encore event! 7:30pm-11:00pm at the DAO.

**UVic observing:** TBA October

**Cattle Point observing:** October 7th 7PM

**Annual General Meeting:** Sunday November 27th, 6:00pm, Cedar Hill Golf Course.

More details on our Annual General Meeting to come shortly, including the menu and guest speaker. Our AGM also includes the election of our Executive and Board of Directors. If you would like to run for a position, please let our Past President know! [pastpres@victoria.rasc.ca](mailto:pastpres@victoria.rasc.ca).

Remember: to keep up to date with Victoria Centre happenings, just go to our website at [victoria.rasc.ca](http://victoria.rasc.ca).

I see we have several new members to the Victoria Centre. Welcome!! I hope we can help you with whatever your astronomical interests are. Always feel free to join in in any of our activities and meetings, and don't hesitate to contact us if you need anything at all. We're here for you.

With Autumn approaching, often with some of the best observing conditions of the year, I hope you will join us at any of our scheduled activities, or just get out there and enjoy the night sky!

Clear skies,  
Sherry.

## September Meeting Speaker

### Professor Sun Kwok:

#### **Stardust: the cosmic seeds of life**

How did life originate on Earth? For over 50 years, scientists believed that life was the result of chemistry involving simple molecules such as methane and ammonia cooking in a primordial soup. Recent space observations have revealed that old stars are capable of making very complex organic compounds. The stars then ejected the organics and spread them all over the Milky Way Galaxy. There is evidence that these organic dust particles actually reached the early Solar System. Through bombardments by comets and asteroids, the early Earth inherited significant amounts of star dust. Was the development of life assisted by the arrival of these extraterrestrial materials? In this talk, we describe discoveries in astronomy and solar system science over the last 10 years that resulted in a new perspective on the origin of life.

**Prof Sun Kwok's** research areas are astrochemistry and stellar evolution. An author of many books he currently serves as President of IAU's Commission on Astrobiology.

### Scheduled Speakers Fall 2016

Wed Oct 12th : Dr Christian Marois (NRC)  
Searching for Habitable Planets Around our Closest Neighbors – The Alpha Centauri Triple Star System

Sunday Nov 27th **AGM**: Paolo Turri (UVIC)  
Adaptive Optics in Astronomy and their results.



### ASTRONOMY CAFE



Our weekly **Astronomy Cafe** is an excellent, informal, way to meet us. New comers are especially encouraged. <http://victoria.rasc.ca/events/astro-cafe/>

Fairfield Community Centre - 1330  
Fairfield Rd. Victoria.7:30pm

Contact: Chris Purse for further details  
[vp2@victoria.rasc.ca](mailto:vp2@victoria.rasc.ca)

**Resuming on Monday September 12th and every Monday there after.**



### Email Lists

#### **Observer / CU Volunteers / Members**

Contact Chris Purse to subscribe  
[vp2@victoria.rasc.ca](mailto:vp2@victoria.rasc.ca)



### New Observers Group

Hosted by Sid Sidhu - 1642 Davies Road, Highlands. Call 250.391-0540 for information and directions.



### Cattle Point observing in Victoria's own Urban Dark Sky Park:

<http://victoria.rasc.ca/events/rascals-cattle-point/>

Next Session: **Friday October 7th**  
at 7PM *Weather Permitting*



### Victoria Centre Observatory: Every Saturday Evening.

*Open to those on **the Active***

#### **Observers list only**

*Weather permitting. Dress warmly, and see you out there.*

### Membership Report - September 2016

Total membership is currently **234**. There are 13 members in the grace period which means their membership has expired in the past 2 months. Please contact Chris Purse ([membership@victoria.rasc.ca](mailto:membership@victoria.rasc.ca)) if you would like to check the status of your membership.



## Victoria RASCALS Share the Sky By Reg Dunkley

During the Summer interlude most organizations gear down and take a bit of a break. The Victoria Centre of RASC, however, shifted into overdrive. On 13 Saturday evenings from the 14th of May to the 20th of August RASC Victoria, together with the Friends of the DAO, invited the Public to join them on the Hill and share their enthusiasm and knowledge of Astronomy.

A total of 2221 people visited the “Star Parties at the DAO” this Summer. The early birds got to park near the Dome while the late comers staggered up the steps from the lower parking lot. Upon their arrival visitors were presented with an extraordinary variety of astro offerings including the following:

1) Three **tours of the Plaskett Telescope** were conducted each evening. Every 45 minute tour consisted of a 15 minute talk on the history of the Plaskett given by Chris Gainor, Dan Posey or Don Moffat followed by a presentation by Ben Dorman which had more of a science focus. Michel Michaud was often found at the controls of the 72 inch reflector. If skies were clear an additional session was held where the scope was pointed at deep sky objects that were projected live on the screen.

2) Over the course of the Summer more than 15 **scientific presentations** were delivered in the lecture hall at the Centre of the Universe. These interesting talks were given by RASC members, the UVic Astronomy Department as well as astronomers from the NRC Herzberg Institute. On some evenings two different presentations were made, often to a full house. This excellent program was arranged and coordinated by David Lee.

3) Each evening, six **30 minute shows** were conducted in the **Planetarium** located in the Centre of the Universe Astronomy Museum. Most of these entertaining and informative shows were performed by Aaron Bannister and Aria Gates-Smith. In the Lobby, **Science Ventures** conducted demonstrations while **Friends of the DAO** ran the store.



**RASC Members Prepare Their Scopes as They Await Nightfall and the Eager Crowds**



**Meanwhile Dan Posey Provides the Historical Context at the Pier of the Plaskett Telescope**



**And In the Lecture Hall David Lee Explains How Amateurs Take Stunning Astrophotos**

4) The **Main Event** was the **Night Sky**. This was where the RASC Scope Owners took centre stage. They actually arrived on Observatory Hill well before nightfall, typically between 6:30 and 7PM, to set up their equipment. This involved considerable effort as their instruments are usually heavy and can be challenging to align.

During mid summer, the onset of darkness is slow to arrive and many of the scopes were trained on the Sun after solar filters were affixed. Ken Mallory and Chris Purse brought special solar scopes to the party which had Hydrogen Alpha filters. The Public was amazed by the solar prominences that leapt from the Sun's limb.

The weather was not always favourable early in the season but during the August sessions skies were usually clear with light winds and warm temperatures. It was magic time! Mars and Saturn were in perfect position. The rings of Saturn seemed to generate the strongest response. When so much time is spent looking at screens these days, the act of viewing raw light that travelled all that way to land on your retina makes the experience so much more authentic. It was probably the enthusiastic and appreciative WOW's that motivated RASC observers to continue to come back every week and generously share their time, expertise, knowledge and valuable equipment. What an extraordinary contribution!

The *Start Parties at the DAO* have been wildly popular. The new web ticketing system implemented by Matt Watson now sells out within 10 minutes! This remarkable series did not occur spontaneously. The recently formed *Friends of the DAO* signed an agreement with the NRC to use the facilities. NRC funded the security services. Nelson Walker coordinated the RASC volunteers this summer. In order to ensure things ran smoothly a **Person In Charge (PIC)** is assigned each evening. He/She provided direction to the floating volunteers and was in radio contact with the Commissionaires to coordinate activities and to trouble shoot problems as they arose. There were at least 25 volunteers on the Hill each evening which corresponded to over 1500 hours of astronomical outreach delivered during this Star Party season. **Congratulations to all involved!**



**Prem and Commissionaires inspect visitor tickets at the bottom of the hill.**



**The Honourable Judith Guichon, Lieutenant Governor of British Columbia Observes the Sun in the Telescope of Chuck Fitness**



**The 4 PIC's Chris, Nelson, Sherry and Lauri**



## M33 and Galactic Rotation Curves- by Reg Dunkley

The Triangulum Galaxy, M33, is sometimes referred to as the Pin Wheel Galaxy but that name is actually reserved for M101. It is the second closest spiral galaxy with a distance estimate of 2.77 million light years using the Cepheid variable method. It is slightly further than Andromeda M31 (2.54 Mly) and lies within 1 Mly of that galaxy in the nearby Triangulum constellation. There is evidence of tidal interaction between M33 and the larger M31.

M33 has a visible angular diameter of 71' by 41' which is more than twice the diameter of the Moon. With a magnitude of 5.7, its light is spread over a large area making it a relatively faint object. It lacks the dense nucleus of Andromeda and only has about one tenth the number of stars of the Milky Way. It is inclined at an angle of 54 degrees which by the use of trigonometry allows the **rotational velocity** about the centre of M33 to be calculated from **radial velocity** measurements.

One method of determining the radial velocity is to use a radio telescope to measure frequency shifts in the 21 cm band caused by the Doppler effect. Radiation in the 21 cm band is associated with neutral hydrogen H I (See "Hydrogen in a Nutshell"). This source of radiation was discovered in the early 1950's when radio astronomy was "the new kid on the block." Dutch astronomers were at the forefront and in 1956 erected a 25m dish at Dwingeloo which at the time was the largest steerable radio telescope in the world. In 1957-58, Jan Oort's student [Louise Volders](#) made measurements of the radial velocity at seven locations along the major axis of M33 at intervals of 1/4 of a degree. She discovered that the radial velocity and in turn the rotational velocity of clouds of hydrogen rotating around M33 **did not drop off** as one moved away from the galactic centre. According to "[Keplerian dynamics](#)" **this was not supposed to happen!** At the time this contradiction was brushed off by some as possible errors involving "side lobes".

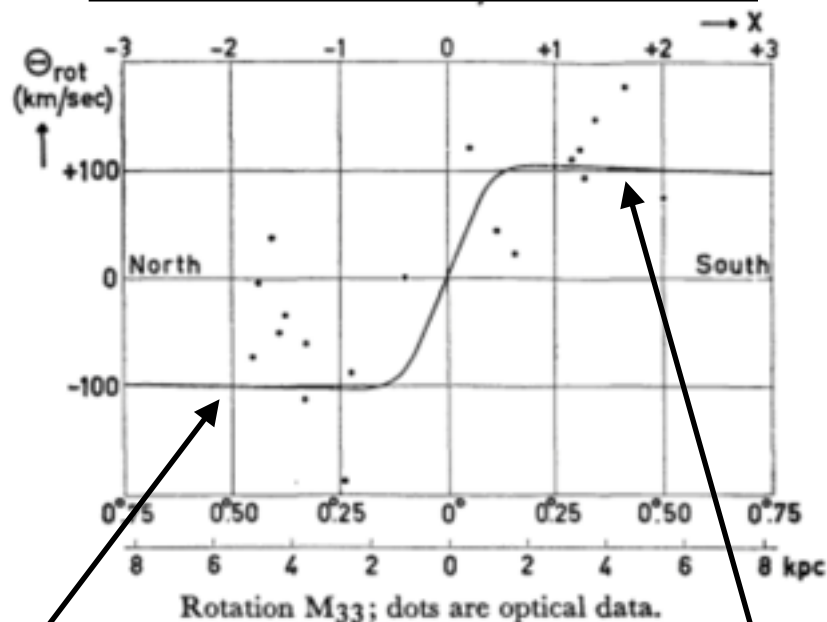
### Hydrogen in a Nutshell

When using "Astro Speak" it can be rather confusing to keep various forms of hydrogen straight.

**H<sub>2</sub>** refers to **molecular hydrogen** which is made up of two hydrogen atoms bound together.

**H I** refers to single hydrogen atoms, called **neutral hydrogen** and are comprised of a single proton and electron. Both protons and electrons have a quantum property called spin. They can either have the same spin or the opposite spin. There is a slight energy difference between these two states. When the spin shifts or flips from one mode to another this emits radiation in the 21 cm wavelength band at a frequency of 1420 Mhz. This has much lower energy than the visible spectrum of light but it is able to penetrate clouds of interstellar dust.

**H II** is confusingly called "H two" and refers to areas of **ionized hydrogen**. Radiation from the very hot O-type and B-type stars peak in the ultraviolet and can ionize or separate the electron from the hydrogen nucleus (proton). When the electron recombines with the nucleus it will emit radiation at characteristic wavelengths. The red light emitted by this process at a wavelength 656 nm is called *Hydrogen Alpha*.

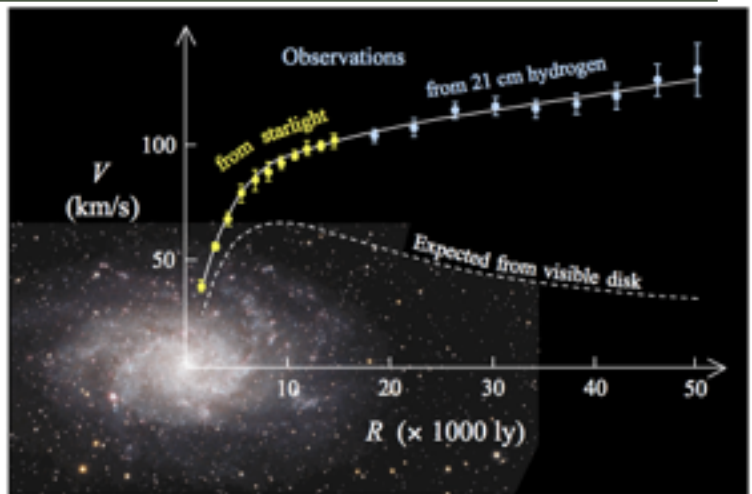


### Louise Volder's Galactic Rotation Curve for M33

Notice the **flat nature** of the curve. This was not supposed to happen!

An [extended Rotational Curve for M33](#) with H I 21 cm data obtained from the 305 m diameter Arecibo radio telescope which has a resolution of 3.8 arc min compared to 34 arc min for the 25m Dwingeloo scope used by Volders.

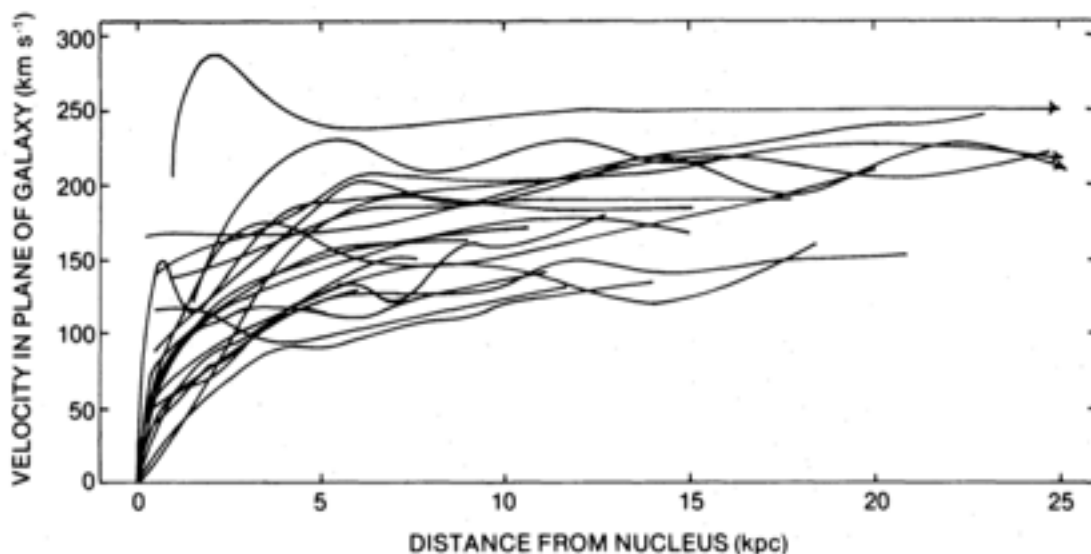
The next woman to enter the fray was American astronomer Vera Rubin. In 1970 she and her colleague Kent Ford published a rotation curve for the Andromeda galaxy. This curve, which was based on optical spectra of various H II hot spots on M31, showed a character similar to the Volders M33 result.



Rubin and Ford continued their investigations of the rotational properties of spiral galaxies in the 1970's. In 1978, using Ford's improved spectrograph on the Kitt Peak 4 metre telescope they concentrated on making radial velocity measurements of 21 nearby edge on galaxies. Their [paper](#), published in 1980 showed that in every galactic rotation curve the velocity increased or remained steady as one moved away from the galactic centre. Their conclusions are stunning and in part say: *"The mass is not converging to a limiting mass on the edge of the image. The conclusion is inescapable that non luminous matter extends beyond the optical galaxy."* "Non luminous matter" became known as "dark matter" and their work on

galactic rotation curves profoundly rocked the field of astrophysics.

It is very difficult to make an unwelcome discovery that contradicts conventional thinking. This would be particularly challenging for a woman back in the 1970's, whose entry into the Astronomical Old Boy's Club was probably met with some resistance. The magnitude of Vera Rubin's contribution was remarkable and she received numerous rewards including the Gold Medal of the Royal Astronomical Society. She was the first woman to receive this honour since Caroline Herschel in 1828. The examples set by Louise Volders and Vera Rubin serve as an inspiration for young women who wish to pursue a career in Astronomy.



A composite of Rubin and Ford's Rotational Curves for 21 Galaxies of Various Sizes and Luminosities

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## An Observer's Thoughts on the Summer of 2016

by *Diane Bell*

"Hey look, Diane - there's the Teapot of Sagittarius above the trees. You have the best chance in the next hour or so!" As we entered deeper twilight on the first night at Bright Angel Park, my neighbouring camper pointed toward the low trees as he positioned his telescope and camera. The southern horizon in this regional park - just south of the city of Duncan, provided us with a good view of this Messier-laden treasure chest.

As guests of the Cowichan Valley Starfinders' Club in early August, it was time to get to work - and to take in some good night-sky views. We don't often have the opportunity to hunt through this area of the sky at the centre of the Milky Way - and to see our Galaxy's central glow adjacent to the spout of the Teapot. We would have to travel out of the light-polluted city centre to find a good southern horizon.

I observed 40 Messier objects and some planets that night, through my large binoculars and 8 inch Dob telescope. Sagittarius did not disappoint! The sky was excellent with good seeing and transparency. My other neighbour was setting up his 20 inch Dob 'scope across the field. He celebrated his successful deep-sky hunt through part of his challenging Arp Galaxy List, throughout the night. The rest of us intrepid sky-watchers added our excitement along with him as well.

We met again in late August at the RASC Star Party, on the Metchosin Cricket Field.

The first night was magical. The familiar stars and constellations arced gently above our heads; the Summer Triangle glowed with all its treasures, and the Milky Way meandered through the sky like a river. The conversations on the field over by the many telescopes carried through to a good part of the early morning.

We spotted the Pleiades rising through the city-glow in the northeast. Fomalhaut hung low in the south - and the faint but whimsical

constellation of Capricornus with the familiar "Thrifty Foods" smile, cartwheeled very gently from the southeast to the southwest. I stayed up until 4:30 AM to see Orion rise, ever higher in the southeast. My neighbour in the tent next to mine wanted to see the Sky Hunter "wake" from his long summer's sleep, so she set her alarm for 3 AM. For my fellow camper and myself, it was a great experience. We even spotted Gemini's Castor and Pollux through the low light pollution from Victoria! I slept fitfully as the wind buffeted my tent but just before 5:30 AM, I was rewarded with a spectacular view of Sirius, sparkling like a diamond over the Olympic Mountains in the ever-lightening dawn of Saturday morning. I was gifted with the beauty of the skies - and community that night, with the company of friends on the field.

This brings me to the latest challenge that I've set for myself. In the RASC newsletter that was provided in the September/October issue of SkyNews, a clarification was stated that descriptions (observations and sketches) were now expected in order to obtain a Messier or NGC Observing Certificate. A few years ago, I was fortunate to receive a Messier Observing Certificate, after completing my list with the date, time and year.

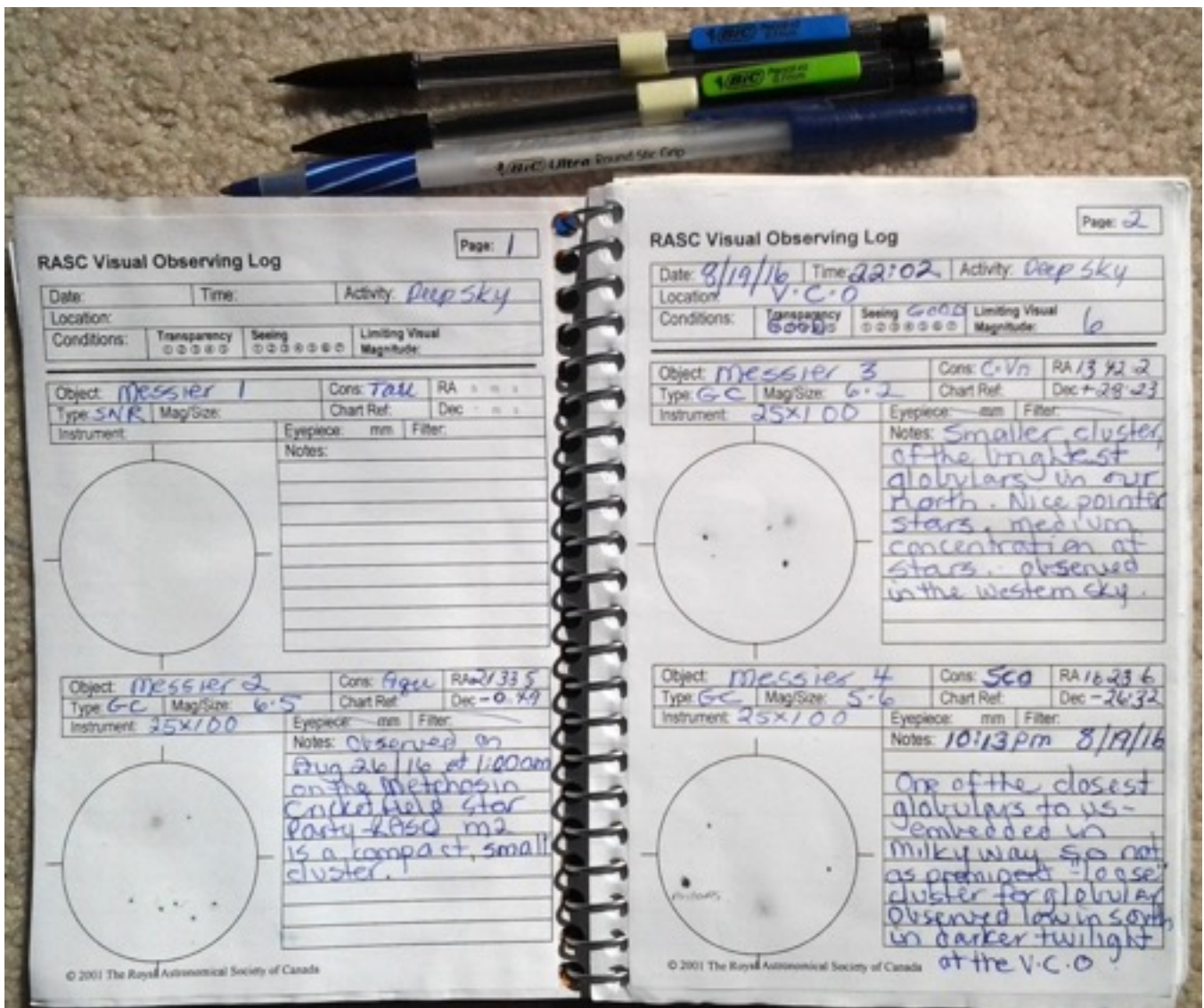
Alan Whitman, the Observing Chair of the RASC, has raised the bar. I'm raising the bar for myself as well. ***I've decided to sketch every Messier object in the sky***, starting with some of the easier globular clusters. I bought a simple spiral-bound notebook and pasted in some of the visual observing log sheets provided by the RASC. I found some HB mechanical pencils with good erasers, and put a collar of "glow-in-the-dark" duct tape around the middle of each, as I am notorious about misplacing things at night! There will be many nights of opportunity to get out under the stars with 'scopes and binoculars, to tackle this project - a learning curve for Yours Truly.

**So - who else is up to the challenge with me?**

***Clear Skies.***

***...Diane***





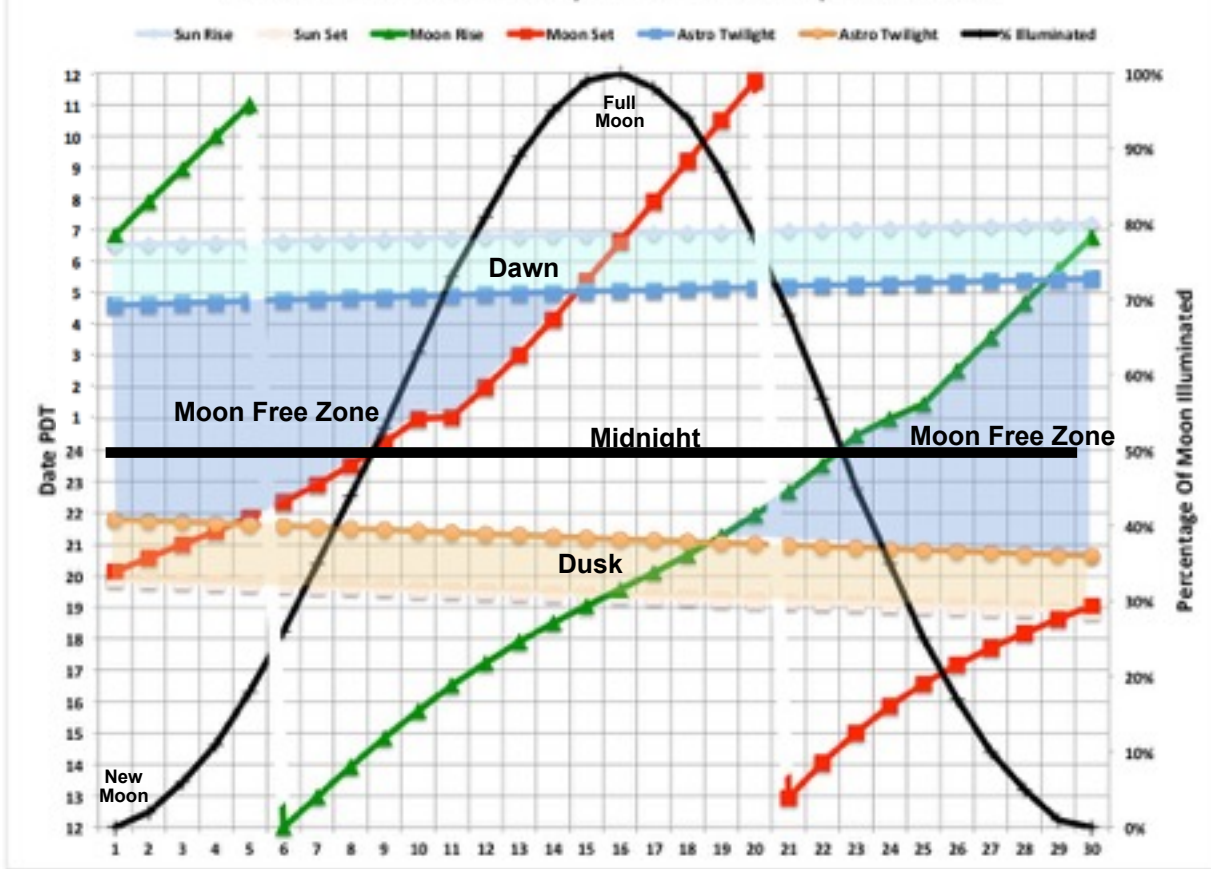
The Beginning of Diane's Messier Log Book. Good Luck with Your Project Diane!

**What Messier Objects Are Visible Tonight?**  
**That is a question I have been asked repeatedly at RASC meetings.** Now I have found the answer! It involves an amazing web application developed by RASC Calgary Centre Member Larry McNish. It is called **Larry McNish's Night Time Planner V1.2** and it can be easily set for Victoria's location from a drop down list. Be sure to enter the UTC offset for PST (8.0). It will display the Time of Maximum Altitude for every Messier Object. It can also include Deep Sky Wonders as well as Caldwell and Finest NGC Objects. Astronomical Twilight and Moon Rise Data are also available. It will likely put the VCO AstroPlanner out of business. Check it out at: <http://members.shaw.ca/rmcnish/darksky/>

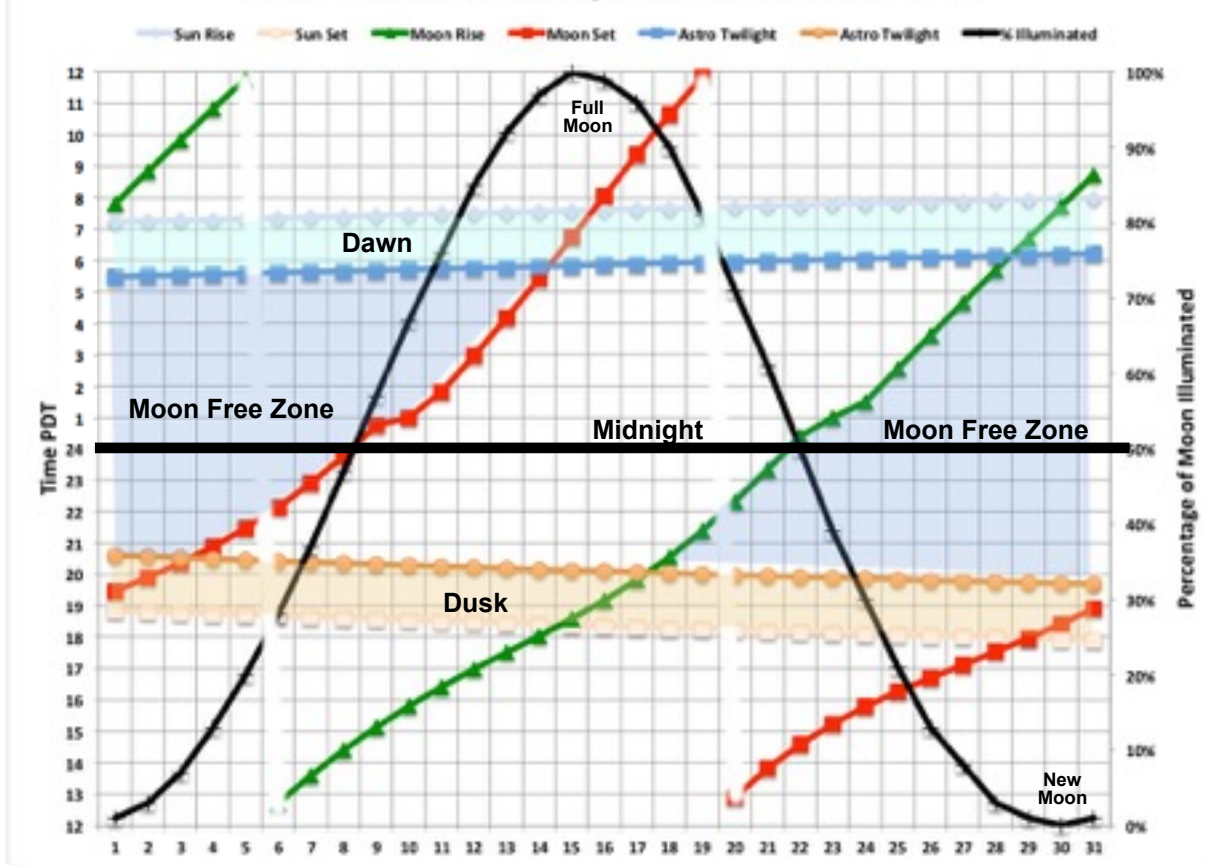


**You Don't Have to Travel to London to Visit the Astronomy Café.** It is Open Every Monday at 7:30 PM at Sir James Douglas School. [Click here for details.](#)

### Victoria Centre Observatory Astro Planner - September 2016



### Victoria Centre Observatory Astro Planner - October 2016



## RASC Victoria Centre Council 2015 / 2016

POSITION	NAME	E-Mail
Past President:	Nelson Walker	<a href="mailto:pastpres@victoria.rasc.ca">pastpres@victoria.rasc.ca</a>
President	Sherry Buttnor	<a href="mailto:president@victoria.rasc.ca">president@victoria.rasc.ca</a>
First Vice President	Michel Michaud	<a href="mailto:vp@victoria.rasc.ca">vp@victoria.rasc.ca</a>
Second Vice President	Chris Purse	<a href="mailto:vp2@victoria.rasc.ca">vp2@victoria.rasc.ca</a>
Treasurer	Bruce Lane	<a href="mailto:treasurer@victoria.rasc.ca">treasurer@victoria.rasc.ca</a>
Secretary	Leslie Welsh	<a href="mailto:secretary@victoria.rasc.ca">secretary@victoria.rasc.ca</a>
Librarian	Michel Michaud	<a href="mailto:librarian@victoria.rasc.ca">librarian@victoria.rasc.ca</a>
Technical Comm Chair / E-Mail	Matt Watson	<a href="mailto:admin@victoria.rasc.ca">admin@victoria.rasc.ca</a>
Skynews Editor	Reg Dunkley	<a href="mailto:editor@victoria.rasc.ca">editor@victoria.rasc.ca</a>
Media Relations		<a href="mailto:media@victoria.rasc.ca">media@victoria.rasc.ca</a>
Telescopes / School programs	Sid Sidhu	<a href="mailto:telescopes@victoria.rasc.ca">telescopes@victoria.rasc.ca</a>
National Representative	Lauri Roche	<a href="mailto:nationalrep@victoria.rasc.ca">nationalrep@victoria.rasc.ca</a>
Light Pollution Abatement	Dave Robinson	<a href="mailto:lighting@victoria.rasc.ca">lighting@victoria.rasc.ca</a>
Membership Coordinator	Chris Purse	<a href="mailto:membership@victoria.rasc.ca">membership@victoria.rasc.ca</a>
Observing Chairperson	Michel Michaud / Jim Stillburn	<a href="mailto:obschair@victoria.rasc.ca">obschair@victoria.rasc.ca</a>
Website Content	Joe Carr	<a href="mailto:web@victoria.rasc.ca">web@victoria.rasc.ca</a>
NRC Liaison	Dr. James Hesser	<a href="mailto:james.Hesser@nrc-cnrc.gc.ca">james.Hesser@nrc-cnrc.gc.ca</a>
NRC Liaison	James di Francesco	
UVic Liaison	Alex Schmid	
Member at Large	David Lee	

### Online Resources

#### Magazines

[SkyNews](#) Our National RASC Newsletter  
[Sky & Telescope](#) Magazine  
[Astronomy](#) Magazine  
[Astronomy Now](#) Astronomy in the UK  
[Amateur Astronomy](#) Magazine  
[Astrophotography](#) Magazine

### Borrowing Telescopes



The centre has telescopes for new and seasoned observers that members can use. Contact Sid Sidhu from the email list above.