

SKYNEWS

SKY NEWS



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April 7th 2016

By John McDonald

NEXT MEETING

Wednesday Sep 14th 2016
At 7:30 PM
Room A104
Bob Wright Centre
University of Victoria
3800 Finnerty Road

www.victoria.rasc.ca

On the Cover Great Red Spot Transits Jupiter

By John McDonald

On Thursday April 7th 2016, with good seeing and just the thinnest veil of high cloud present, conditions were ideal for observing Jupiter at the VCO. From 9PM to 11:30 PM John McDonald captured a series of short videos of Jupiter through the 14 inch SCT using his Canon T3i camera. The videos which were taken every 5 minutes were processed with Registax-6 and assembled into a [wonderful 24 frame movie](#) which followed the journey of the Great Red Spot. By comparing side by side images taken close together, one can obtain a stereographic effect. Employing this technique John also assembled an [amazing 3D Movie!](#) Images of this quality have scientific value and can be used to refine the mission of **Juno**, the next visitor to Jupiter. Check out the article on page 6.

Presidents Report

by Sherry Buttnor

June! It started off more like Juneuary, but as I write this, it's full-on summer heat outside, and the first clear Saturday evening for our summer star parties at the DAO since we opened. Despite the first three Saturdays being clouded out, we still had more than one hundred visitors join us at the DAO for our terrific indoor activities. Nice! That's due entirely to the efforts of volunteers from RASC-Victoria, and also FDAO, and UVic-Science Venture, and our guest speakers. I take a break from writing this report, and head off to the DAO; it was wonderful! Warm, clear, evening, lots of visitors, and of course RASC members to wow them with their enthusiasm and knowledge. We needed a night like that! It also gave us our first real test of our new EventBrite ticketing system and gate procedures, which worked as planned. Let's hope the rest of the series goes as well. We have an incredible lineup of guest speakers this summer, so if you can't help out as a RASC volunteer, tell your friends and

family and come on up as a visitor! <http://victoria.rasc.ca/summer-star-parties-2016-dao/> One more Saturday evening on the hill before we take a break for two weeks, due to the lack of darkness in the evening. This is where I'd really like to see a return to Standard Time all year; most people like the lingering light in the evening, but it's a bane to astronomers, and especially for public outreach events. Also, for the same reason, most of our scheduled events for RASC members are -or will soon be- on hiatus for the summer.

Of course, one highlight of the year is the **RASCals Star Party**, which will be on the weekend of August 26-28 this year, and again will be held on the cricket field behind the district offices here in Metchosin. I'm pleased to report Maan Hani and Dr. Rita Mann will be reprising their presentations at the star party, and we will also have our usual activities and door prizes. There is never a fee to attend, and you can camp on the field all weekend, or drop in as you wish.

Our Victoria Centre member Dr Chris Gainor reports that at the recent RASC National General Assembly, **Dr. Alan Batten** (past President of the Victoria Centre, past President of RASC National, former director of the DAO, and many, many other professional accomplishments) **was proclaimed a Fellow of the Royal Astronomical Society of Canada.** Warmest congratulations to Dr. Batten for this well-deserved honour!

This is my final monthly message until September. It's been quite a year so far, marked by frustrating weather, amazing public outreach (in spite of the frustrating weather!), terrific meetings and guest speakers. Thank you all so much for all you do for RASC-Victoria and astronomy in Victoria, and I wish you all a gentle summer filled with clear, sparkling skies.

Sherry

June Meeting Speaker

Zack Draper UVic Astronomy: *Exploring exoplanetary systems with the Gemini Planet Imager*

The Gemini Planet Imager is an instrument designed to directly image exoplanets and circumstellar disks around nearby stars. Partially built here in Victoria, it is now conducting a 600 hour survey at the Gemini-South observatory in Chile. I will discuss how the instrument works and highlight some of its recent discoveries. Bio: Zack Draper is a second year PhD student at the University of Victoria, where he also received his Masters in 2012. His focus of study are debris disks (collisionally active, asteroid belts) around other stars. He is also member of the Gemini Planet Imager Exoplanet Survey.

DAO Summer Star Party Speakers 2016

June 4th – Imaging Other Worlds (Benjamin Gerard)

June 11th – Monsters in the Dark: Black Holes and Their Messy Habits (Nicholas McConnell)

July 2nd – Introduction to the Night Sky (David Lee)

July 9th – Where Baby Stars Come From: A Look Behind Orion's Dusty Veil (Steve Mairs)

July 16th – Gravitational Waves and a New Era of Discovery (Nicholas McConnell)

July 16th – The Story of the Hubble Space Telescope (Chris Gainor)

July 23rd – The Birth, Life, and Death of Stars (Jared Keown)

July 30th – What is Dark Matter? (Kyle Oman)

August 6th – Observing Planning and Logging Panel Discussion (RASC Members)

August 13th – Light and Life, Sculptors of Earth: The First 2 Billion Years (Dorothy Paul)

August 13th – Voyage to Alpha Centauri (Christian Marois)

August 20th – Astrophotography: Imaging the Sky Panel Discussion (John McDonald, Dan Posey and David Lee)



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/>

Astro Cafe is closed for the Summer and will resume on Monday September 12th

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

Contact: Chris Purse for further details
vp2@victoria.rasc.ca



Email Lists

Observer / CU Volunteers / Members

Contact Chris Purse to subscribe
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 Postponed Until September Due to Late Twilight



Victoria Centre Observatory: Every Friday Evening.

Open to those on the Active Observers list only

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

Membership Report - June 2016

Total membership is currently **224**. There are 22 members in the grace period which means their membership has expired in the past 2 months. Please contact Chris Purse (membership@victoria.rasc.ca) if you would like to check the status of your membership.

CLOSE ENCOUNTERS with JUPITER

By Reg Dunkley

I feel very fortunate that I was around when the Pioneer 10 spacecraft whizzed by Jupiter in 1973. It is hard to forget the excitement that the spectacular imagery generated. In an instant our vision of that planet was profoundly transformed. Things got even better when the Voyager duo captured higher resolution images in 1979 which revealed tantalizing details of Jupiter's menagerie of moons.

Ulysses, Cassini and New Horizons also made close approaches but mainly to steal some of Jupiter's momentum to help fling them on their way. Ulysses, on a mission to study the Sun, travelled all the way to Jupiter just to obtain enough energy to escape the plane of the Solar System and enable it to loop back and explore the polar regions of the Sun. Cassini needed the momentum to get to Saturn while New Horizons used Jupiter as a sling shot to Pluto.

While the above spacecraft were all "flybys", the Galileo mission actually went into orbit around Jupiter to conduct a long term study. Compared to the stunning success of the other missions, Galileo was plagued with problems from the get go. In addition to budgetary battles there was a new design philosophy that the Galileo probe had to be launched by the Space Shuttle. Then the Challenger disaster in 1986 caused a two year delay and heightened safety requirements which prohibited a liquid fuel booster rocket to be carried on the Shuttle. The only way to get to Jupiter was to first send Galileo to Venus to rob some momentum during a flyby. But flying closer to the Sun introduced heat concerns and spacecraft had to be redesigned. Then nuclear power plant disasters raised legal challenges regarding the use of the on board radio isotope thermoelectric generators. The court injunction was not removed until the Shuttle countdown had commenced! Galileo was finally launched in October 1989 but after returning from Venus the umbrella like high gain antenna failed to deploy ... possibly due to failure of lubricants caused by mission delay and excessive heating near Venus. This reduced the communication baud rate with the spacecraft by a factor of 100!

Visitors to Jupiter

- **Pioneer 10:** December 1973
- **Pioneer 11:** December 1974
- **Voyager 1:** March 1979
- **Voyager 2:** May 1979
- **Ulysses:** February 1992
- **Galileo:** and Probe December 1995 to 2003
- **Cassini:** December 2000
- **New Horizons:** February 2007
- **Juno:** July 4th 2016

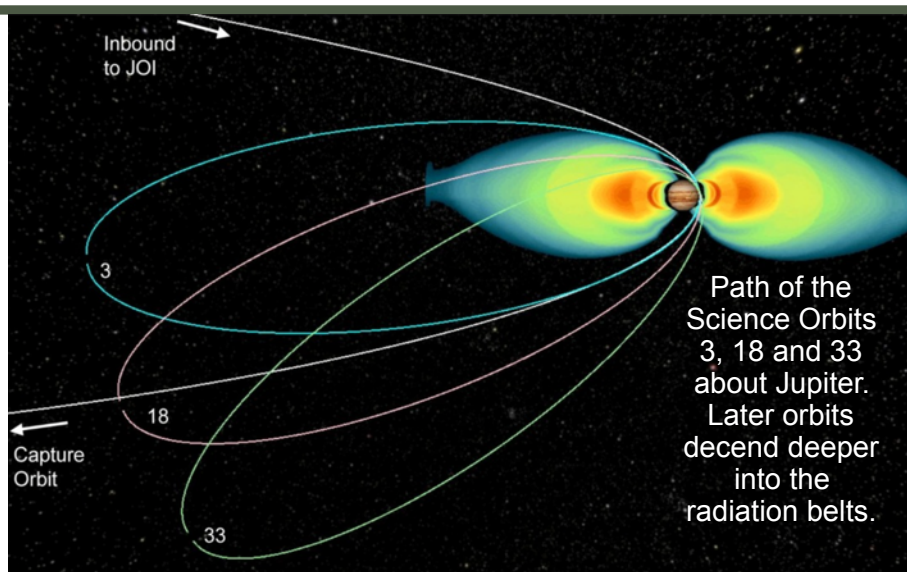
Heroic efforts were made: A probe was dropped into Jupiter's atmosphere and although limited amounts of data and imagery were recovered, the mission was essentially crippled and did not live up to it's potential. The journey ended in 2003 with Galileo deliberately plunging into the Jovian atmosphere.

On it's flyby of Jupiter the Cassini spacecraft captured over 26000 images. One [animation sequence](#) provides remarkable insight to the behaviour of Jupiter's atmosphere. Huge knowledge gaps, however, remain and the return to Jupiter by the Juno Mission in July 2016 is eagerly anticipated.

The design of the Juno Mission has been strongly influenced by measurements of Jupiter's magnetosphere which were obtained on previous flybys. The magnetosphere is a cavity in the solar wind that is caused by Jupiter's intense magnetic field. The "bow shock" on the sunward side is fairly close to Jupiter but a long tale on the opposite side extends almost to Saturn's orbit. It is important because it traps highly energetic charged particles and forms radiation belts 1000 times stronger than Earth's Van Allen belts. These intense belts can seriously damage the electronics on the Juno spacecraft.

The Juno Mission orbit minimizes exposure to these radiation belts. Instead of circling Jupiter in an equatorial plane Juno will be confined to an eccentric polar orbit. It will swoop down from the north pole, come within 4800 km of Jupiter's cloud tops (called the Perijove) and then exit from the south pole travelling in an 11 day orbit

which keeps it well away from the strongest zone of radiation. It will complete 33 of these orbits and the path will gradually shift to extend coverage of Jupiter's surface. As a result, later in the mission, Juno will descend deeper into the radiational belts. The initial orbits will employ the most sensitive sensors while later orbits will utilize more robust instruments. After completion of the 33 science orbits Juno will plunge into the atmosphere and end the mission.



The polar orbit will prevent Juno from visiting the moons. Unlike both Galileo and Cassini, no atmospheric probes will be deployed. The mission however has strongly focused science programs and is **optimized to investigate:**

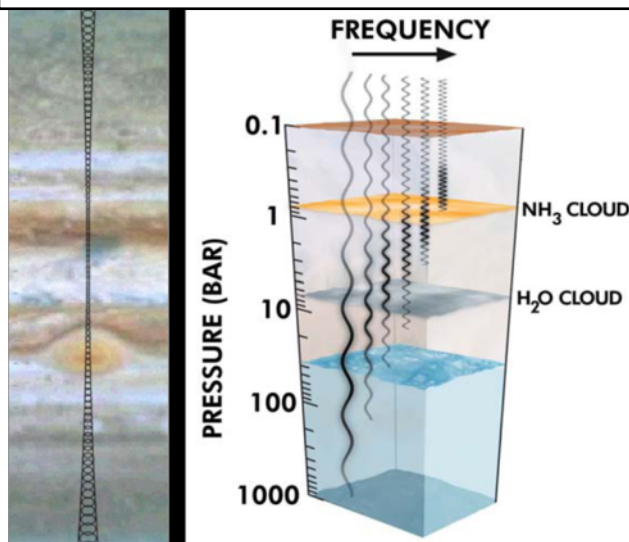
- 1) **Origin and evolution** of Jupiter by measuring relative chemical abundance
- 2) **Interior structure** by improved mapping of gravitational and magnetic fields.
- 3) **Atmospheric dynamics** composition and cloud opacity down to 100 earth atmospheres.
- 4) **Magnetosphere and Aurora.**

It would appear that the Juno team has learned lessons from the Galileo crew. To keep things simple, Juno has a fixed high gain antenna with no *umbrella like qualities*. It is spin stabilized at 2 RPM so there is no vulnerabilities with reaction wheels that cut the Kepler mission short. It is powered by three large solar panels to keep the environmental community happy and resembles a giant ceiling fan. It was launched in August 2011 and will be inserted into an orbit around Jupiter on July 4th. The initial two orbits are highly eccentric with a period of 53 days and Juno won't enter its working orbit until November. Five of the first 6 orbits are optimized for remote sensing and the remaining orbits are focused on gravity science. In gravity mode a very sensitive doppler shift technique is employed to detect and map gravitational anomalies and requires that the high gain antenna be pointed directly at Earth. The remote sensing instruments however will

continue to operate in this mode but they will not point directly down at the planet. No doubt the keen team of engineers and scientists at NASA will devise ingenious routines to make the most of the opportunity until the mission comes to a close in February 2018.

NASA has also marshalled the resources of a multitude of professional scopes and spacecraft to complement this mission. As the next article describes, they have also engaged the amateur astrophotography community to lend it's support. Let's cross our fingers on July 4th and hope that the orbital insertion goes well!

**Microwave Radiometer Probes Deep Atmosphere
Ultraviolet, Infrared Cameras & JunoCam are the other remote sensing instruments on board.**



Amateur Support For Juno - An Opportunity for Collaboration by Reg Dunkley

We are used to viewing Jupiter from afar. In contrast, as Juno skims 4800 km above Jupiter's clouds it's nose will be up against the window pane. It will only see a very narrow swath of the planet. It is important that mission scientists obtain a broader overview. This will help them to understand the larger scale processes that are underway as they collect finer resolution information. It will provide a context at the instance of shutter click and will also allow them to monitor the evolution in the area of interest.

The demand for time on professional and space borne telescopes is too great to exclusively devote to Jupiter. The capability of amateur astrophotographers, however, has experienced a remarkable improvement in this digital era. As a result amateurs are now in the position to provide an important contribution. They have the ability to monitor and record large and intermediate scale processes on Jupiter in sufficient detail to assist in the Juno Mission. This capacity has been recognized by the

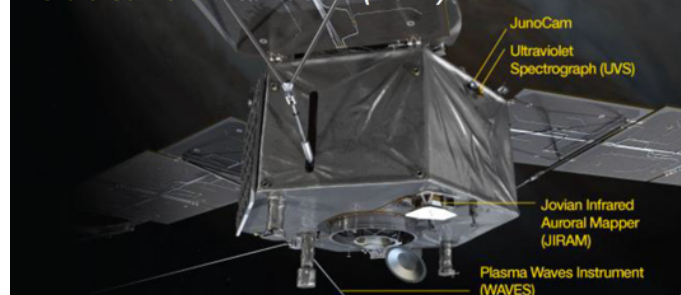
key remote-sensing instruments:

Microwave Radiometer— MWR (JPL)

UV Spectrometer— UVS (SwRI)

Infrared Camera— JIRAM (ASI)

Visible Camera— JunoCam (Malin)

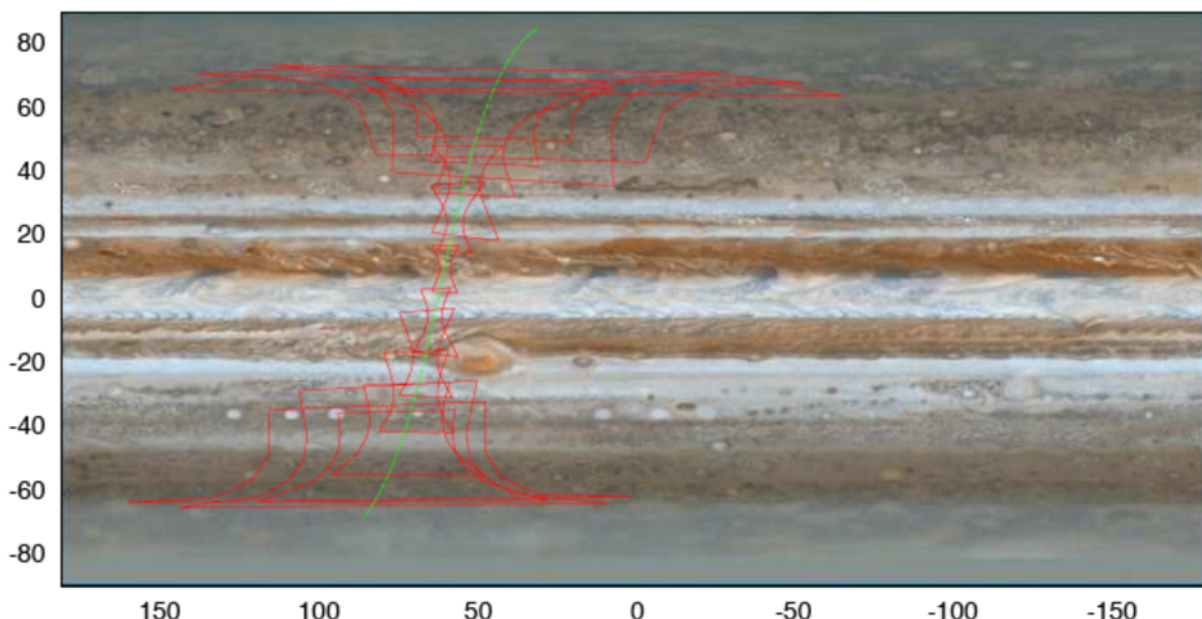


professional community and in May 2016 a special workshop was held in Nice France. Some of the most accomplished amateur astrophotographers gathered together with professionals and image processing software developers to share information and plan a strategy to move forward. The presentations of 30 of these talks have been placed [online](#). They reflect the current state of the art of amateur planetary astrophotography and it is an extraordinary treasure trove of information.

In addition to many exotic sensors there is a colour camera onboard Juno. Built by the

One longitudinal swath

orbit 7 -- 2016 Dec 24 potential image areas



manufacturers of Malin Cam this camera has been named **JunoCam**. It is a 1200 by 1600 pixel camera with red, green, blue and methane filters. Because the camera is rotating and capturing imagery in narrow swaths it will be challenging to interpret the raw data. As it traverses the polar regions, however, processed images will be able to display for the first time a 58 degree view of Jupiter's polar caps. The finest possible resolution will be 15 km per pixel at the equator which is 8 times better than that captured by the Hubble Space Telescope. JunoCam could take up to 120 images on a north to south swath. Due to data transmission restrictions of 40 Mbytes per orbit only about 12 images per orbit will be made available and a selection process is required.

The primary purpose of the JunoCam is public outreach and engagement. The [outreach web site](#) will allow amateurs to upload their imagery for all to view. There is a discussion area on the web site where enthusiasts can identify points of interest and argue why a JunoCam image in that area should be selected. There will also be a voting section which will identify targets of greatest interest. Finally there will be a results area where JunoCam imagery can be viewed or enhanced.

One of the issues discussed at the Nice workshop was the importance to adhere to a standard protocol for image format and processing methodology. This would simplify image access and inter-comparison. I am not certain if a protocol has been finalized yet. After Juno enters orbit in July there will be a four month shake down period before the official imaging program begins. Perhaps they will resolve matters during that interval.

Juno may be a unique opportunity for amateur astrophotographers to participate in a planetary mission. If it goes well it may open doors for further collaboration. With it's excellent 14 inch telescope, the Victoria Centre Observatory may be well positioned to make a contribution to the Juno Mission. It is a project that we may want to consider.

Annual RASC Metchosin Star Party!

Once again, the Victoria Centre of the Royal Astronomical Society of Canada will be holding our annual Star Party on the cricket field, on the weekend of August 26-28. Everyone is invited! We will have guest speakers, door prizes, talk-and-walk among the stars, and viewing through our members' telescopes. Something fun for stargazers of all ages! Come for an evening, or stay the whole weekend with us. Camping on the field is permitted, and admission is always FREE! Many thanks to Metchosin Mayor and Council, and Metchosin Fire Department for their support!

Where: Cricket field behind Metchosin District offices.

When: Noon August 26 to noon August 28, 2015

Guest speakers: August 26, Dr Rita Mann. August 27, Maan Hani.

More info: <http://victoria.rasc.ca/events/rascals-star-party-2016/>

Contact: Sherry. president@victoria.rasc.ca
250-474-0554 See you there!!

September Monthly Meeting Speaker Sun Kwok: Stardust: the cosmic seeds of life

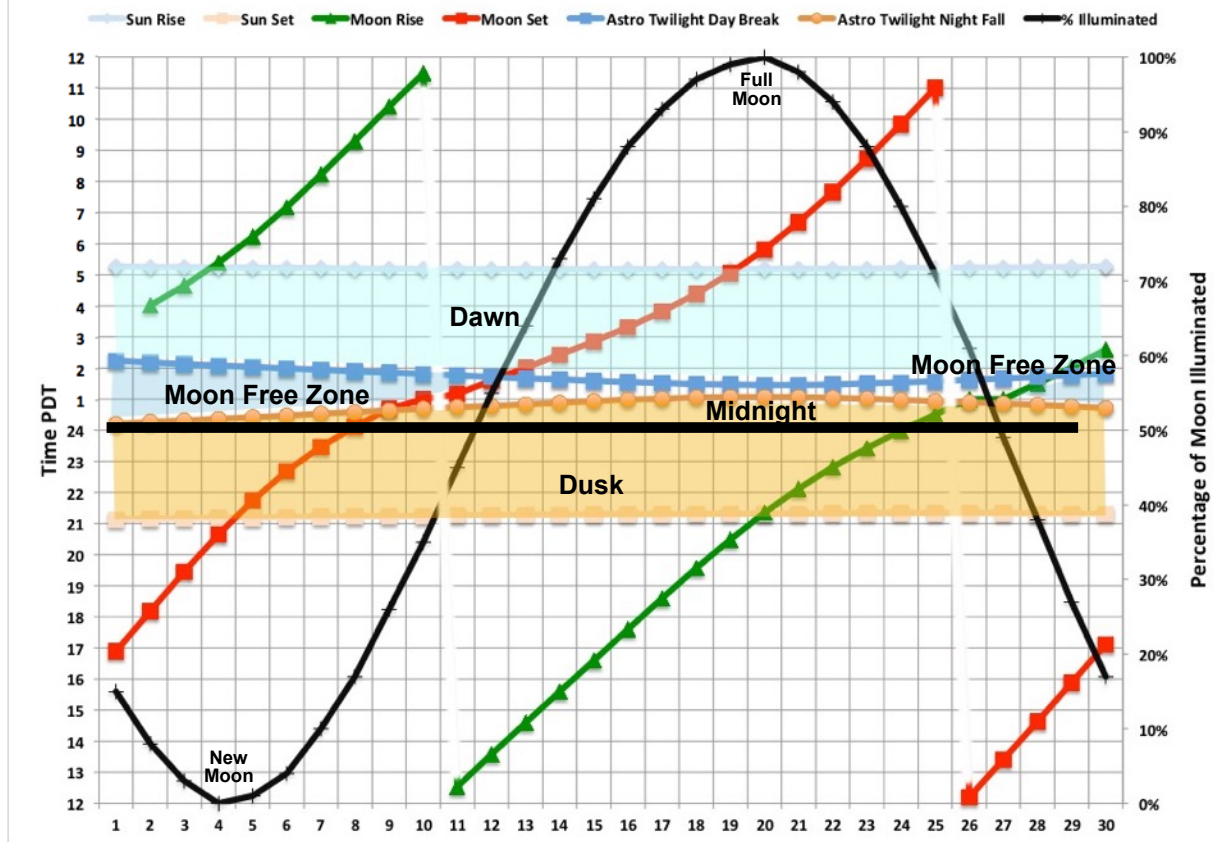
How did life originate on Earth? For over 50 years, scientists believed that life was the result of chemistry involving simple molecules such as methane and ammonia cooking in a primordial soup. Recent space observations have revealed that old stars are capable of making very complex organic compounds. 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.

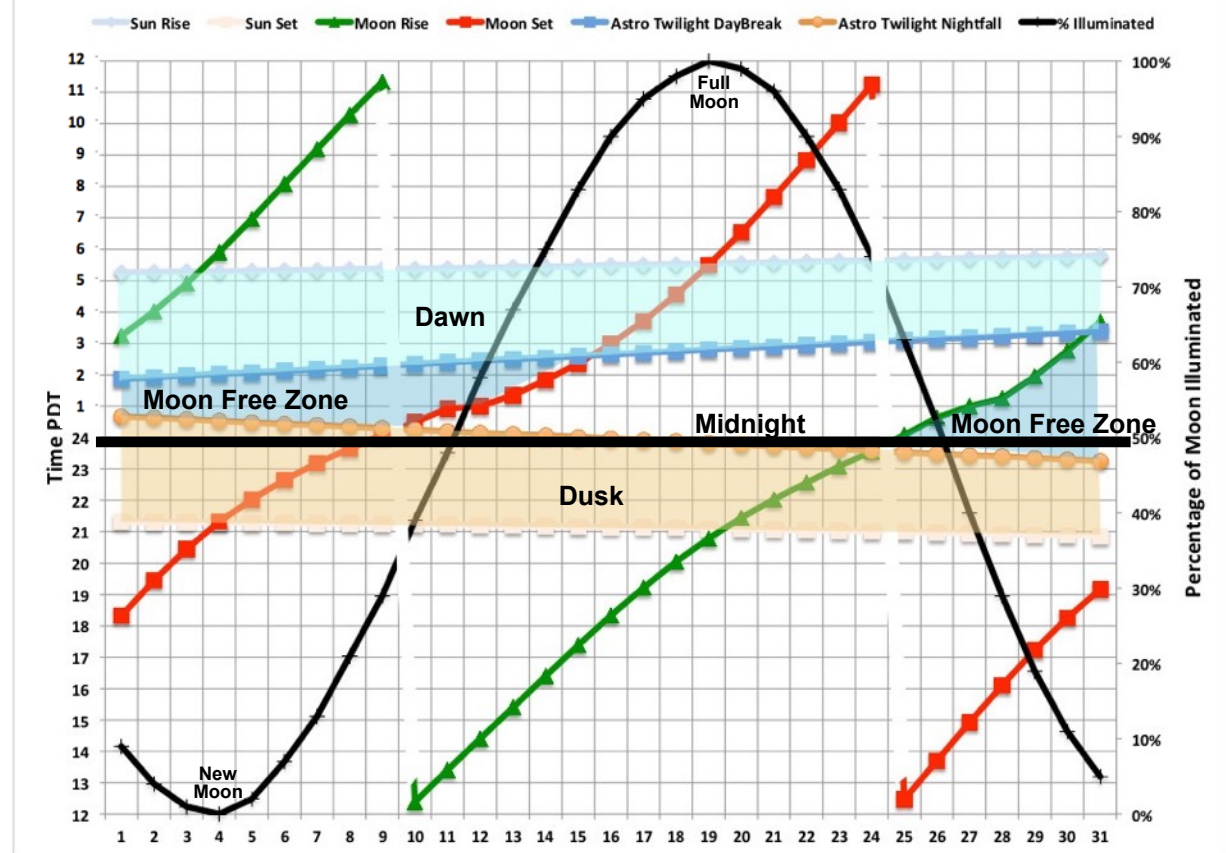
Scenes from Astronomy Day Royal Victoria Museum May 14 2016



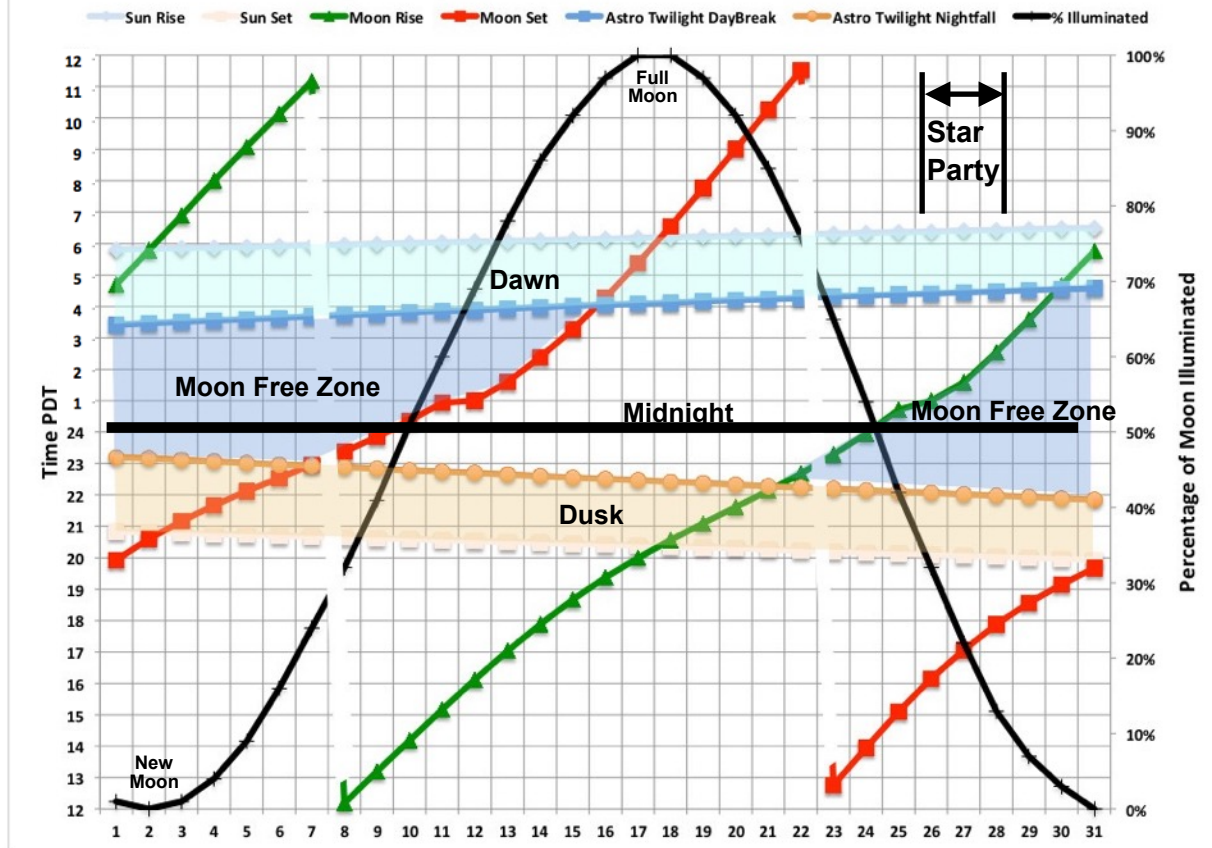
Victoria Centre Observatory Astro Planner - June 2016



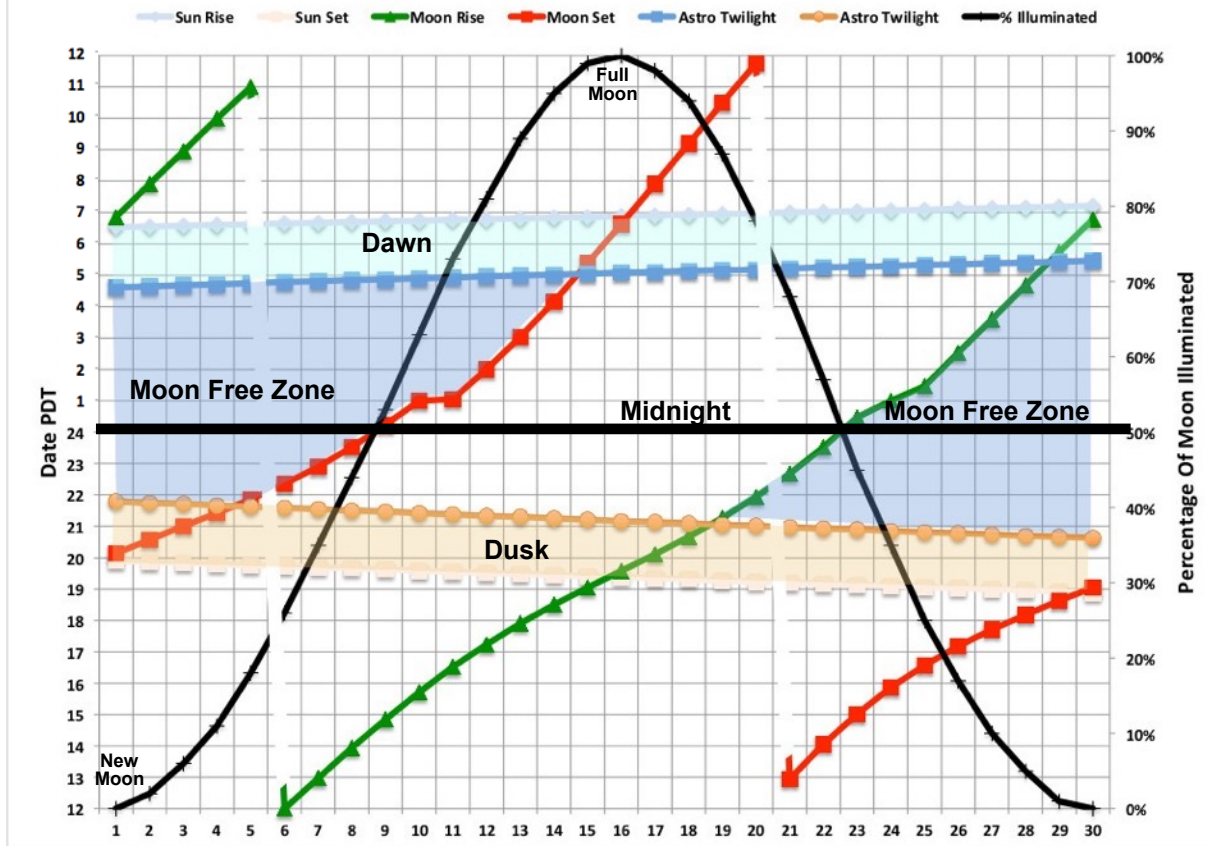
Victoria Centre Observatory Astro Planner - July 2016



Victoria Centre Observatory Astro Planner - August 2016



Victoria Centre Observatory Astro Planner - September 2016



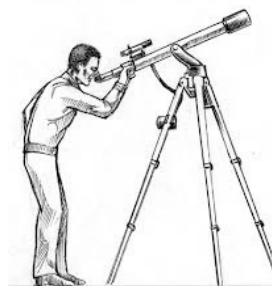
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Online Resources

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.