

RASC Toronto Centre – www.rascto.ca
The Sky This Month – February 24 to March 30, 2016
by Chris Vaughan

NEWS

Space Exploration – Public and Private

Ref. <http://spaceflightnow.com/launch-schedule/>

Launches

February 24, 6:46-8:23 pm - SpaceX Falcon 9 rocket from Cape Canaveral Air Force Station, Florida, payload SES 9 comsat.

March 9 at 12:22 am - Ariane 5 ECA rocket from Kourou, French Guiana, payload Eutelsat 65 West A comsat.

March 10 TBD - PSLV rocket from Satish Dhawan Space Center, Sriharikota, India, payload IRNSS 1F navsat.

March 12 TBD - Soyuz rocket from Baikonur Cosmodrome, Kazakhstan, payload Resurs P3 Earth obs sat.

March 14 at 5:31 am - Proton rocket from Baikonur Cosmodrome, Kazakhstan, payload ESA's ExoMars Trace Gas Mars Orbiter and the Schiaparelli lander.

March 18 at 5:26 pm - Soyuz rocket from Baikonur Cosmodrome, Kazakhstan, payload manned Soyuz spacecraft to ISS with members of the next Expedition crew. The capsule will remain at the station for about six months, providing an escape pod for the crew.

March 22 at 11:02-11:32 pm - Atlas 5 rocket from Cape Canaveral Air Force Station, Florida, payload 6th Orbital Sciences Cygnus cargo freighter to ISS.

Planet 9

<http://www.findplanetnine.com/p/blog-page.html>

This Month in History (a sampling)

Ref. <http://www2.jpl.nasa.gov/calendar/>, <http://space.about.com/library/weekly/bldatechoice.htm>,
<http://www.planetary.org/multimedia/space-images/charts/whats-up-in-the-solar-system-frohn.html>,
<http://www.lunar-occultations.com/rlo/calendar.pdf>

Astro-Birthdays and Milestones

Mar 11, 1811 – Urbain Le Verrier is born, celestial mechanist calculated Uranus' predicted orbit

Mar 23, 1749 - Pierre Simon Laplace is born, astro-mathematician

Mar 23, 1956 – Gary Kronk is born, noted American writer on comets and meteor showers

Astronomy and Space Exploration

Feb 23, 1987 - Supernova 1987A was discovered by Ian Shelton, Oscar Duhalde, and Albert Jones

Feb 24, 1968 – Jocelyn Bell at Cambridge announces the first pulsar PSR1919+21 near Sagitta

Feb 27, 1611 – Johannes Fabricius published De Maculis in Sole observatis, first paper on sunspots

Mar 13, 1781 – Searching for double stars with 6" f/13 newtonian, William Herschel discovers Georgium Sidus aka Uranus

Mar 23, 2001 - MIR is de-orbited into the Pacific Ocean

Mar 24, 1930 - Pluto named

Mar 24, 2006 - Pluto demoted

Mar 25, 1655 - Christian Huygens discovers Titan

Star Parties, etc.

Ref: <http://ontariostargazing.ca/astronomy-star-party-and-astronomy-events-listing-for-canada/>,
<http://www.amsky.com/calendar/events/#may>

“RASC Solar Observing”, Ontario Science Centre Teluscape – Sat. 10 to noon, on Mar 5 (or 12)

“RASC Dark Skies Observing”, Long Sault Conservation Area – window runs Mar 7-10

“RASC City Skies Observing”, Bayview Village Park, Toronto – windows runs Mar 14-17

OBSERVING

Messier Marathon 2016

New Moon weekend of March 12 opens the prime opportunity for a Messier Marathon this year. Watch the RASC TC Yahoo Group for news.

Globe at Night 2016

A citizen science program to map light pollution around the world. During the observing window, you are encouraged to make a visual measurement to determine the limiting magnitude of stars you can observe at your location. The website provides charts for assisting observations, instructions for submitting results, and an interactive map showing current and historical results. Details are at <http://www.globeatnight.org/>
The March campaign's focus is on **Orion** from March 1-10.

Sunrise/Sunset

February 24, sunrise at 7:03 am, sunset at 5:59 pm (10h56m of daylight)

March 30, sunrise at 7:02 am, sunset at 7:43 pm (12h41m of daylight)

Daylight Savings Time commences on March 13.

Vernal Equinox on Sunday, March 20 at 12:30 am

Astronomical Twilight

The skies are not truly dark until the Sun drops well below the horizon. Below are the times of true darkness, also known as Astronomical Twilight. Astrophotography is best done in full darkness. Details are at <http://www.timeanddate.com/sun/canada/toronto?month=4>,
<http://www.timeanddate.com/astronomy/canada/toronto>

February 24, astronomical twilight ends at 7:35 pm and starts at 5:26 am (9h51m of imaging time)

March 30, astronomical twilight ends at 9:21 pm and starts at 5:21 am (8h00m of imaging time)

Moon - Orbit

Apogee – Fri, Feb 26 at 10:00 pm

Perigee – Thu, Mar 10 at 2 am

Moon - Phases

Tue, Mar 1 at 6:11 pm – Last Quarter Moon (rises around midnight)

Tue, Mar 8 at 8:54 pm – New Moon (**Indonesia Total Solar Eclipse**)

Tue, Mar 15 at 1:03 pm – First Quarter Moon (sets around midnight)

Wed, Mar 23 at 8:01 am – Full “Lenten/Crow/Sap/Worm” Moon (penumbral lunar eclipse south pacific)

Moon – Conjunctions, Eclipses, etc.

Lunar X – Tuesday, March 15 at 8:29 pm!

On rare occasions, for a few hours near the First Quarter Moon, a feature called the Lunar X becomes visible. When the rims of the craters Parbach, la Caille, and Blanchinus are illuminated from a particular angle of sunlight, they form a small, but very clear and bright X shape. It's located on the terminator about one third of the way up from the southern pole (bottom) of the Moon (at 2° East, 24° South). The prominent round crater Werner sits to the lower right. The next Lunar X will start to develop in dusk, sometime after 7:30 pm on Tuesday, March 15th, peak at 8:29 pm, and persist until approximately 9:30 pm, very well placed for GTA observing.

Lunar Appulses and Conjunctions

After midnight on **February 29** and **30**, the waning gibbous Moon will hop over Mars, landing approx. 5° northwest (to upper right) and 7° northeast (to lower left) from Mars respectively. In the pre-dawn hours of **March 2**, the Last Quarter Moon will sit approx. 3° north (to upper left) of Saturn, low in the eastern sky. Very low in the east at dawn on **March 7**, the very old crescent Moon (3.5% illum.) will sit approx. 3° northeast (to the upper left) of Venus. All night on **March 21**, the Full Moon will sit 2.5° south (to the lower right) of Jupiter – **Photo op!** After midnight on **March 28** and **29**, the waning gibbous Moon will hop over Mars, landing approx. 6.5° and 7° from Mars respectively.

Planets and Dwarf Planets

Mercury is just completing a very poor morning apparition due to a shallow Ecliptic and increased distance from Earth. It reaches superior solar conjunction on March 23, and re-appears in the evening western sky towards the end of March when, at magnitude -0.75, it will set at 8:15 pm about 40 minutes after sunset.

Venus remains a bright (magnitude -3.9) dawn twilight object very low in the eastern sky, rising at 6 am on February 24 (90% illum.) and at 6:32 am on March 30 (95% illum.). On Feb 28, it passes with 5' of Beta Cap. Visible low in the east after 6 am on **March 7**, the very old crescent Moon (3.5% illum.) will sit approx. 3° northeast (to the upper left) of Venus.

Mars in late February is a midnight-to-morning magnitude 0.4 object exhibiting a disk diameter of 8" in Libra, rising at 12:45 am. After mid-March it enters Scorpius, passing about 10' from Acrab on March 15/16. On March 30 it rises at 12:27 am and has brightened to magnitude -0.5 and grown to a disk of 12" as we have drawn closer to it (from 1.13 down to 0.8 AU). After midnight on March 28 and 29, the waning gibbous Moon will hop over Mars, landing approx. 6.5° and 7° from Mars respectively.

Jupiter is retrograde in Leo all month is effectively an all-night target as opposition occurs on March 8, when it will be 36 light-minutes away and exhibit a 44" disk diameter and magnitude -2.5. All night on **March 21**, the Full Moon will sit 2.5° south (to the lower right) of Jupiter – **Photo op!**

Special Jupiter Moon Events (listed in Astronomy Skylights)

Feb 26 from 4:37 to 5:02 am, Europa and Io double shadow transit (midpoint alt ~30°)

March 7 from 7:27 to 8:57 pm, Io and Europa double shadow transit (midpoint alt ~21°) Look for incomplete circles due to overhead moons.

March 14/15 from 10:20 pm to 12:32 am, Europa and Io double shadow transit (midpoint alt ~46°). Look for the shadows to move closer together at the end.

March 22 from 12:23 to 2:31 am, Europa and Io double shadow transit (midpoint alt ~51°)

March 23 from 7:47 to 9 pm, Io and Ganymede double shadow transit (midpoint alt ~27°)

March 29 from 3 to 4:25 am, Europa and Io double shadow transit (midpoint alt ~29°)

Saturn is a pre-dawn object in Ophiuchus brightening slightly from magnitude 0.5 to 0.4 during the month, and beginning to move retrograde after March 25. It rises at 2:24 am on February 24 and at 1:09 am on March 30. In the pre-dawn hours of March 2, the Last Quarter Moon will sit approx. 3° north (to upper left) of Saturn, low in the eastern sky.

Uranus (mag. 5.9) is prograde through Pisces, and only observable due to the steep Ecliptic, until about mid-March, very low in the western sky in early evening. On February 24, it sets at 8:41 pm.

Neptune is moving prograde in Aquarius all month (mag. 8) and is unobservable due to Solar conjunction on Feb 28.

Pluto, northeast of Sagittarius' teapot, is a faint mag. 14.2 object. In late February, it's low in the southeastern sky before dawn, rising at 4:37 am. On March 30th it rises at 3:21 am. Poor observability.

Vesta (mag. 8.4) is a poor early evening target moving prograde from Pisces to Cetus during the month. It sets at 10 pm on Feb 24 and at 8:30 pm on March 30.

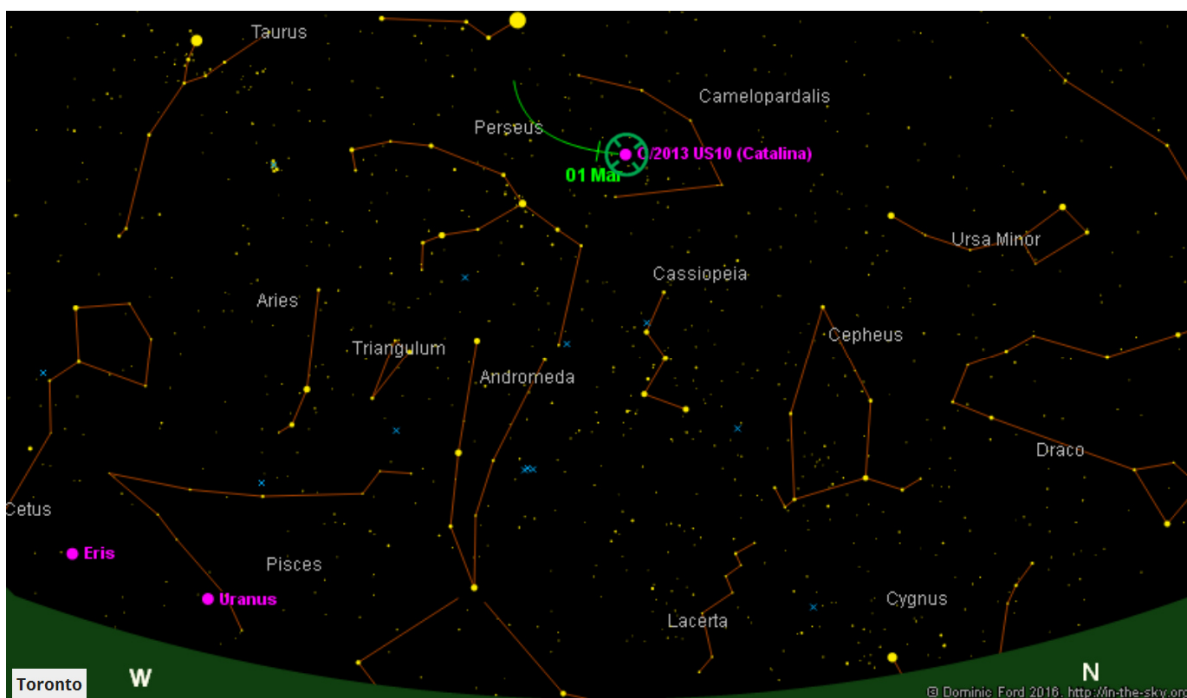
Ceres, in Aquarius, reaches Solar conjunction on March 3, and is unobservable.

Hypothetical Planet 9 (mag >22)...

Comets

Ref <http://www.aerith.net/comet/weekly/current.html>, <http://cometchasing.skyhound.com/>, <https://in-the-sky.org/data/comets.php>, <https://www.ast.cam.ac.uk/~jds/>, <http://www.cobs.si/>

C/2013 US10 (Catalina) just keeps on giving! In late February it is around magnitude 8 and fading slowly, but remains conveniently positioned for observing in large apertures under dark skies all night long this month (circumpolar). On February 24 it is on the south side of Camelopardalis, and over the next month heads south, ending up midway between Capella and Mirfak on March 30.



Meteor Shower(s)

Ref. <http://www.amsmeteors.org/meteor-showers/meteor-shower-calendar/>

Nothing major to report

Asteroids

Ref. <http://neo.jpl.nasa.gov/ca/>, <http://www.minorplanetcenter.net/>
<https://www.youtube.com/watch?v=ONUSP23cmAE#action=share>

On February 29, Asteroid (2309) Mr. Spock is at closest approach to Earth at 12.01 AU, magnitude +15.3, in Leo ~33' from NGC3462

According to the Minor Planet Centre...

Near-Earth Objects Discovered This Year: 323 (~180/month)
Minor Planets Discovered This Year: 13,521 (~7,510/month)
Comets Discovered This Year: 14 (~8/month)
Observations This Year: 4.0 million

Satellites

A GTA International Space Station morning pass series commences on March 5 (Most are visible between 4:30 and 6 am). Evening passes commence on March 29 (most between 8:30 and 9:30 pm). Some higher/brighter ones include*:

Date	Mag.	Time	Direction	Alt.
07-Mar	-2.3	5:33:52 am to 5:39:46 am	from SSW to ENE	42°
09-Mar	-3.4	5:26:14 am to 5:31:11 am	from WSW to ENE	86°
10-Mar	-2.3	4:35:54 am to 4:38:33 am	from ESE to ENE	45°
11-Mar	-2.8	5:18:06 am to 5:22:24 am	from WNW to NE	44°
22-Mar	-2.8	6:16:33 am to 6:23:03 am	from NW to ESE	60°
23-Mar	-2.1	5:25:53 am to 5:30:02 am	from NNW to E	38°
24-Mar	-3.4	6:08:05 am to 6:13:53 am	from WNW to SE	66°
25-Mar	-3.2	5:17:48 am to 5:21:06 am	from NNE to ESE	70°
26-Mar	-2.4	6:00:22 am to 6:04:11 am	from WSW to SSE	29°

*far future predicted times may shift slightly

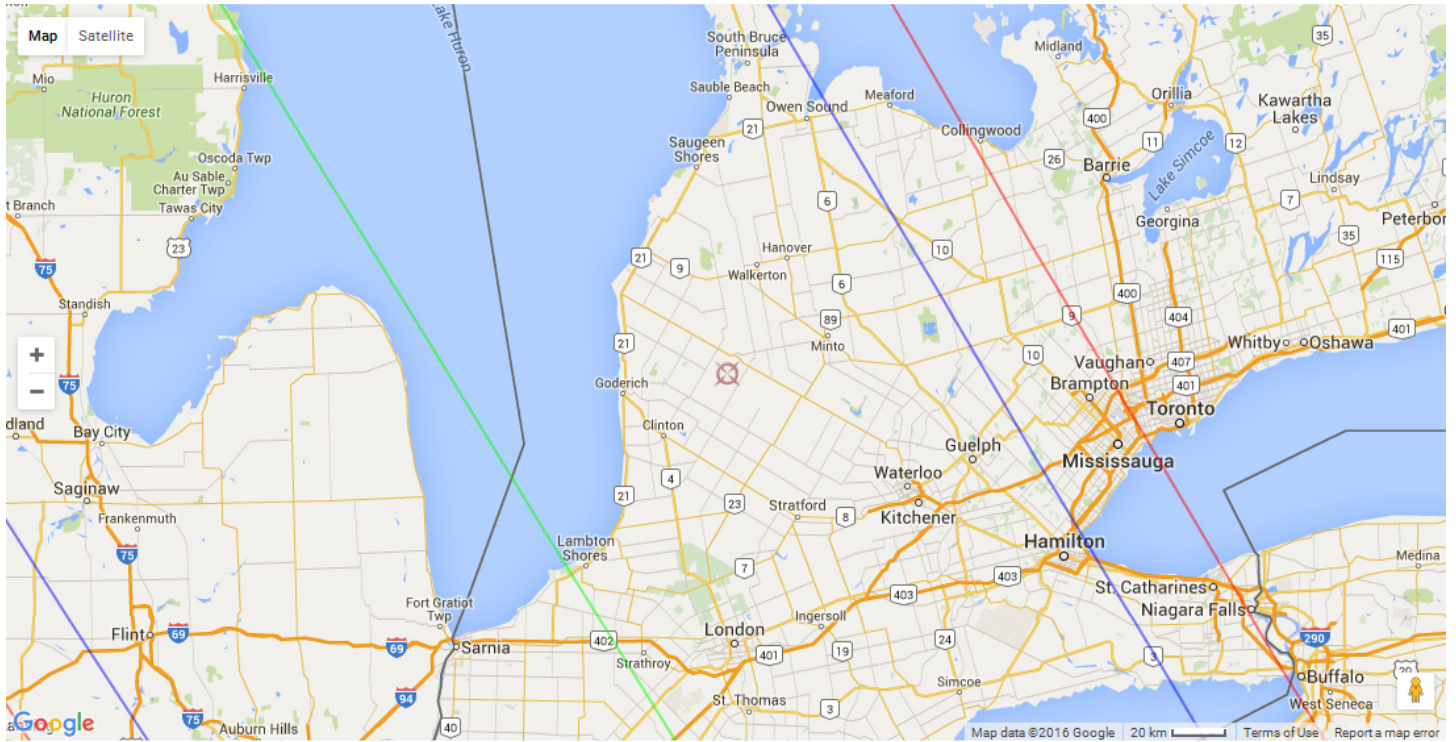
Iridium Flares most frequent evening flares occur between 6 pm and 8:30 pm, with morning flares common from 5 to 6:30 am. Local occurrences info at www.heavens-above.com and enter your location, from phone/tablet apps, Chris Vaughan's Skylights (subscribe to email [here](#) or visit www.astrogeoguy.tumblr.com)

Occultations – Lunar and Asteroidal

Ref: <http://www.asteroidoccultation.com/> and <http://www.poyntsource.com/New/Global.htm> (additional links on the following URLs open track maps)

Rank 100 - 09 Mar 2016 at 12:17 am, asteroid (130) Elektra (mag 12.4) occults star 2UCAC 37538800 (mag 12.1), visible western GTA to Lake Huron, dips 0.9 mags for 19.7seconds, alt 56°
(http://www.asteroidoccultation.com/2016_03/0309_130_36470.htm)

Elektra is a double asteroid, so observers are asked to record 5 minutes before and after, and be distributed well across the predicted track. The similarity in magnitudes between the star and the asteroid will make for interesting viewing and a significant magnitude drop as they move together, merge, and separate.



Constellations near the Meridian (Annually in March)

8 pm: Canis Major, Monoceros, Canis Minor, Gemini, E Auriga, W Lynx

10 pm: Pyxis, W Hydra, Cancer, E Lynx

Midnight: Antlia, Hydra, Crater, Sextans, Leo, Leo Minor, Ursa Major

Late Winter Star party Skylights (Annually in March)

A list of suggested interesting targets was presented at the February 6th Members Night at DDO. The contents, complete with a Sky Safari app targets list, are available for download at <http://rascto.ca/content/february-targets-list>

See you at Long Sault C A, Glen Major Forest, Bayview Village Park, CAO, or DDO!

Questions or comments to chris.vaughan@astrogeo.ca

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("Skylights" content is archived at www.astrogeoguy.tumblr.com)