RASC Toronto Centre – www.rascto.ca
The Sky This Month – Oct 11 to Nov 15, 2017 (times in EDT & EST)
by Chris Vaughan

NEWS

Space Exploration – Public and Private

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

Launches

Oct 11 at Approx. 6:53-8:53 pm EDT - A SpaceX Falcon 9 (re-used) rocket from Kennedy Space Center, payload SES-11/EchoStar 105 hybrid comsat.
TBD - United Launch Alliance Atlas 5 rocket from Cape Canaveral Air Force Station, classified payload for U.S. National Reconnaissance Office.
Oct 12 at 5:32 am EDT - Soyuz rocket from Baikonur Cosmodrome, Kazakhstan, payload 68th Progress cargo delivery to the ISS.
Oct 13 at 5:27 am EDT - Eurockot Rockot from Plesetsk Cosmodrome, Russia, payload Sentinel 5 Precursor Earth obs sat for ESA (measures atmospheric air quality, ozone, pollution and aerosols).
Oct 17 at 5:37 pm EDT - Minotaur-C rocket from Vandenberg Air Force Base, CA, payload six SkySat Earth obs sats and CubeSats.
Oct 30 at 3:34-5:58 pm EDT - Falcon 9 rocket from Cape Canaveral, payload Koreasat 5A comsat.
Nov 7 at 8:42:30 pm EST - Arianespace Vega rocket from ZLV, Kourou, French Guiana, payload MN35-13 Earth obs sat for Morocco.
Nov 10 at 4:47:03-4:48:05 am EST - United Launch Alliance Delta 2 rocket from Vandenberg Air Force Base, CA, payload 1st spacecraft in NOAA's next-gen Joint Polar Satellite Weather Sat System.
Nov 10 at 8:02 am EST - Orbital ATK Antares rocket from Wallops Island, Virginia, payload 9th Cygnus cargo freighter delivery flight to the ISS.
4th Quarter TBD - Rocket Lab Electron rocket from Mahia Peninsula, New Zealand, payload 2nd orbital test flight from new facility on New Zealand's North Island.
4th Quarter TBD - SpaceX Falcon 9 rocket from Cape Canaveral, payload 30W-6 comsat for Spain's Hispasat.
November TBD - SpaceX Falcon Heavy rocket - from Kennedy Space Center, 1st demonstration flight (3 Falcon 9 rocket cores strapped with 27 Merlin 1D engines).

JUNO at Jupiter

Presently executing a series of 53 day orbits. The seventh pass occurred on September 1. News at https://www.missionjuno.swri.edu/news/

This Month in History (a sampling)

Ref. http://www2.jpl.nasa.gov/calendar/, 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

Oct 11, 1758 – German mathematician, discoverer of Pallas and Vesta, **Heinrich Wilhelm Olbers** is born
Oct 20, 1632 - English architect and astronomer **Christopher Wren** is born
Oct 25, 1877 – American astronomer, co-developer of the Hertzsprung–Russell diagram **Henry Norris Russell** is born

Nov 8, 1656 – English astronomer and mathematician **Edmond Halley** is born
Nov 8, 1932 – American hard Sci-fi author **Ben Bova** is born
Nov 9, 1934 - American astronomer, planetary scientist, author, and science evangelist **Carl Sagan** is born
Nov 12, 1924 - French astronomer, aeronaut, discoverer of Saturn's moon Janus (while rings were edge on) **Audouin Dollfus** is born
Nov 15, 1709 - Dutch amateur astronomer, co-discoverer of Great Comet of 1744, **Dirk Klinkenberg** is born

Astronomy and Space Exploration
Oct 13, 1884 - Greenwich established as the **universal time**
Oct 15, 1997 - 20th Anniversary of **Cassini Mission** launch
Oct 18, 1967 - 50th Anniversary of **Venera 4** Venus spacecraft landing, with floating capsule!
Oct 21, 1897 – 120th Anniversary of **Yerkes Observatory** founding
Nov 2, 1917 - 100th Anniversary of **Mount Wilson 100-inch Telescope** first light
Nov 3, 1957 - 60th Anniversary of **Sputnik 2** launch with dog Laika aboard
Nov 7, 1967 - 50th Anniversary of **Surveyor 6** launch (Moon landing on Nov 10)
Nov 9, 1967 - 50th Anniversary of **1st Saturn V** launch (uncrewed Apollo 4)
Nov 11, 1572 - 445th Anniversary of **Tycho Brahe's** observation of **SN1572**
Nov 14, 1969 - 45h Anniversary of **Apollo 12** launch

Star Parties, etc.

Ref: http://www.amsky.com/calendar/events/#may

"**RASC Dark Skies Observing**", Glen Major Forest – window runs Oct 16-19
"**RASC City Skies Observing**", Bayview Village Park, Toronto – windows runs Oct 23-26
"**RASC Solar Observing**", Ontario Science Centre Teluscape –10 to noon on Oct 14 (or Oct 21), and Nov 4
"**Jasper Dark Sky Festival**", Jasper National Park Dark Sky Preserve, AB – Oct 13-22
(https://jasperdarksky.travel/)
And many more throughout the USA…

OBSERVING

Globe at Night 2017

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 fall campaign's focus is on **Cygnus** from Oct 11-20 and **Pegasus** from Nov 10-19.

Sunrise/Sunset

Oct 11, sunrise at 7:27 am EDT, sunset at 6:40 pm EDT (11h13m of daylight)
Nov 15, sunrise at 7:11 am EST, sunset at 4:52 pm EST (9h40m of daylight)

Sunday, November 5 - Daylight Savings Time Ends (UT-5 hours resumes)

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
https://www.timeanddate.com/sun/canada/toronto?month=10
http://www.timeanddate.com/astronomy/canada/toronto

Oct 11, astronomical twilight ends at 8:15 pm EDT and starts at 5:53 am EDT (9h38m of imaging time)
Nov 15, astronomical twilight ends at 6:31 pm EST and starts at 5:32 am EST (11h01m of imaging time)

Moon - Orbit

Apogee – Tue, Oct 24 at 10 pm EDT
Perigee – Sun, Nov 5 at 7 pm EST

Moon - Phases

Thu, Oct 12 at 8:25 am EDT – Last Quarter Moon (rises around midnight)
Thu, Oct 19 at 3:12 pm EDT – New Moon
Fri, Oct 27 at 6:22 pm EDT – First Quarter Moon (sets around midnight)
Sat, Nov 4 at 1:23 am EDT – Full "Frost / Beaver" Moon

Oct 28 - International Observe the Moon night https://www.lpi.usra.edu/observe_the_moon_night/

Libration

E limb most exposed on Oct 17th (+5.2°) and Nov 13th (+6.7°)
W limb most exposed Oct 31st (–6.7°) and Nov 29th (–7.6°)
N limb most exposed on Nov 5th (+6.5°)
S limb most exposed on Oct 22nd (–6.6°)

Moon – Conjunctions, Eclipses, etc.

Lunar Appulses and Conjunctions
On **Tuesday, October 17**, the old crescent moon will be situated only one degree to the left of Mars. On **Wednesday, October 24** the young crescent moon will sit 5 degrees to the upper left of Saturn. On the evening of **Monday, October 30**, the waxing gibbous moon will sit less than 2 degrees below Neptune. On the morning of **Monday, November 13**, Venus will pass within 0.25° of Jupiter. On **Wednesday, November 15**, the waning crescent moon will pass 4° to the lower left of Mars.

Planets and Dwarf Planets

Mercury reached superior conjunction with the sun on October 8th and will re-appear in the western evening twilight at the close of October. During November, it executes a very poor apparition for mid-northern observers, never climbing very high in the sky due to its position below an already shallow evening ecliptic. Viewed through a telescope during November, Mercury's disk will nearly double in diameter and reduce in phase from almost full to less than half illuminated.

Extremely bright **Venus** shines in the eastern pre-dawn sky during October and November, dropping steadily lower as it swings sunwards – passing a few degrees to the left of the bright star Spica on November 2-3. Throughout the month, Venus exhibits a nearly full phase. On the mornings surrounding Monday, November 13, Venus will pass very close to Jupiter while transitioning from Virgo into Libra. At only 0.25 degrees apart at closest approach, the two planets will fit within the field of view of a backyard telescope's eyepiece.

During October and November **Mars** climbs away from the sun in the eastern pre-dawn sky while its prograde (eastern) motion carries it from Leo into Virgo on Friday, October 13. Meanwhile, Mars will brighten slightly as it slowly decreases its distance from Earth. On Tuesday, October 17, the old crescent moon will be situated only one degree to the left of Mars. On November 14 and 15, the waning crescent moon will pass to the left of Mars.

Jupiter is all but invisible as it approaches solar conjunction on October 26. The planet is visible in the predawn eastern sky during November, moving prograde from Virgo into Libra on November 15. During mornings in mid-month, Jupiter will be very close to Venus, reaching a minimum separation of 0.25 degrees on Monday, November 13. At that time, the two planets will fit together within the field of view of a backyard telescope's eyepiece, and perhaps even observable during the daylight hours!

Yellow-tinted **Saturn** spends the next month in the southwestern evening sky travelling eastward through the stars of southern Ophiuchus. It is visible with naked eyes starting at dusk, setting before 9:50 pm local time on the 11th and at 6:50 pm on November 15th. On Tuesday, October 23 the young crescent moon will sit 7 degrees to the right of the ringed planet. The following evening it will hop to sit 5 degrees to the upper left.

Moving retrograde (westwards) through the stars of Pisces during October and November, **Uranus** reaches opposition on October 19, when it will be closest to Earth for this year. As a result, the blue-green planet will be visible all-night this month. At visual magnitude 5.7, Uranus is observable in binoculars and also with naked eyes under dark skies. The star Omicron Piscium, located about 2 degrees to the planet's lower left, will aid in finding it. On the evening of Monday, October 30, the waxing gibbous moon will sit less than 2 degrees below Neptune. For most of Antarctica and the southern tip of Africa, the moon will occult the planet.

During October and November, tiny blue **Neptune** (magnitude 7.85) is observable in telescopes from dusk until well after midnight. It moves retrograde (westwards) in Aquarius until November 22. The naked eye star Hydor, located only 0.5 degrees above the planet, will aid in finding it with binoculars and telescopes. On the evening of Monday, October 30, the waxing gibbous moon will sit less than 2 degrees below Neptune. For most of Antarctica and the southern tip of Africa, the moon will occult the planet.

Pluto is a faint mag. 14.2 object moving prograde in northeastern Sagittarius, about 1° to the southeast of the naked eye star Albidah. Pluto is an evening target, but a challenge to see due to its dim nature and the low summer ecliptic.

On Sunday, October 29, the major asteroid **(2) Pallas** reaches opposition, when it is closest to Earth (1.695 AU) and brightest for this year. In October and November, it moves southwestward through the stars of Eridanus towards Fornax, which is low in the southern sky. It is visible in a backyard telescope.

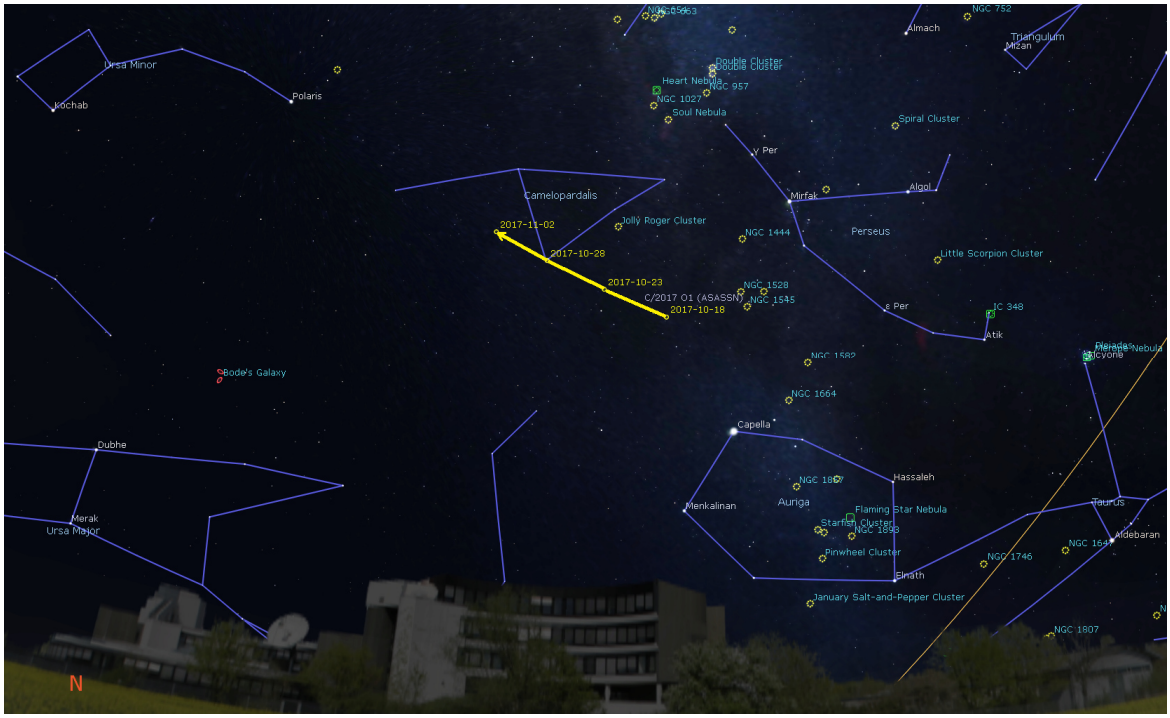
Zodiacal Light

During moonless periods in September and October, the steep morning ecliptic favors the appearance of the zodiacal light in the eastern sky for about half an hour before dawn. This is reflected sunlight from interplanetary particles concentrated in the plane of the solar system. During the two weeks starting after the new moon on October 17, look east for a broad wedge of light rising from the horizon and centered on the ecliptic.

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/

Comet C/2017 O1 (ASASSN) (discovered July 19, 2017 by the "All-Sky Automated Survey for Supernovae") is circumpolar in the northeastern evening sky. It is visible all night, but is highest in the sky about 4 am local time. Currently about magnitude 8, it is predicted to reach a peak brightness of magnitude 7.5 during October. Over the next month it will travel northwards through Camelopardalis, passing close to Alpha Cam on Oct 28.

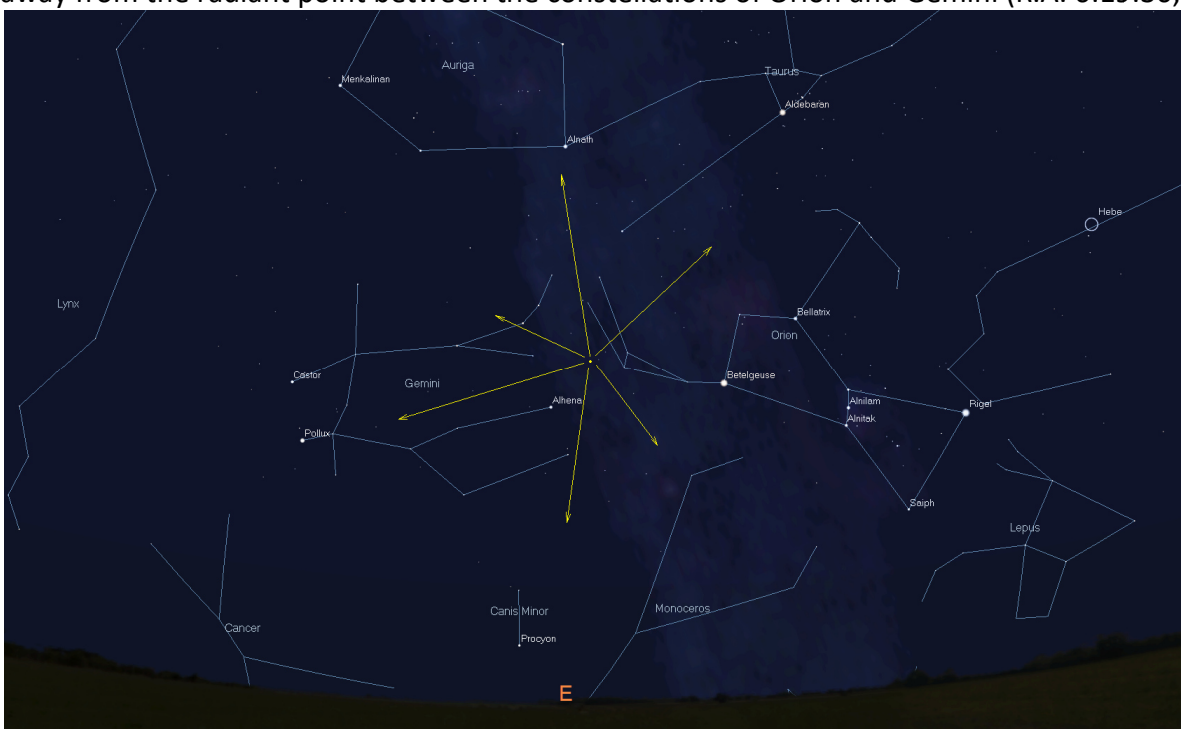


Meteor Shower(s)

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

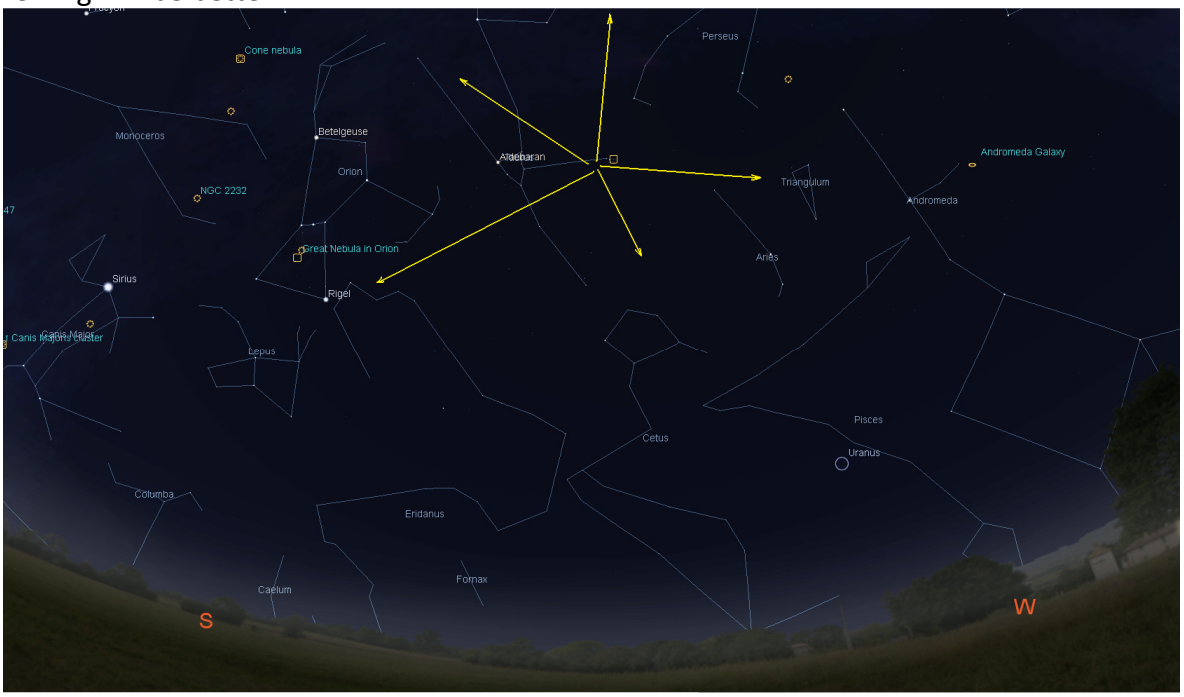
Orionids (September 23rd to November 27th)

The annual Orionid meteor shower, composed of debris from repeated passages of Comet Halley, runs from September 23 to November 27. It peaks between midnight and dawn on **Saturday, October 21** under a dark moonless sky. At that time the sky overhead is moving directly into the densest region of the particle field, producing 10-20 fast meteors per hour. The meteors can appear anywhere in the sky, but will be travelling away from the radiant point between the constellations of Orion and Gemini (R.A. 6:19:30, Dec. +15° 58’45”).



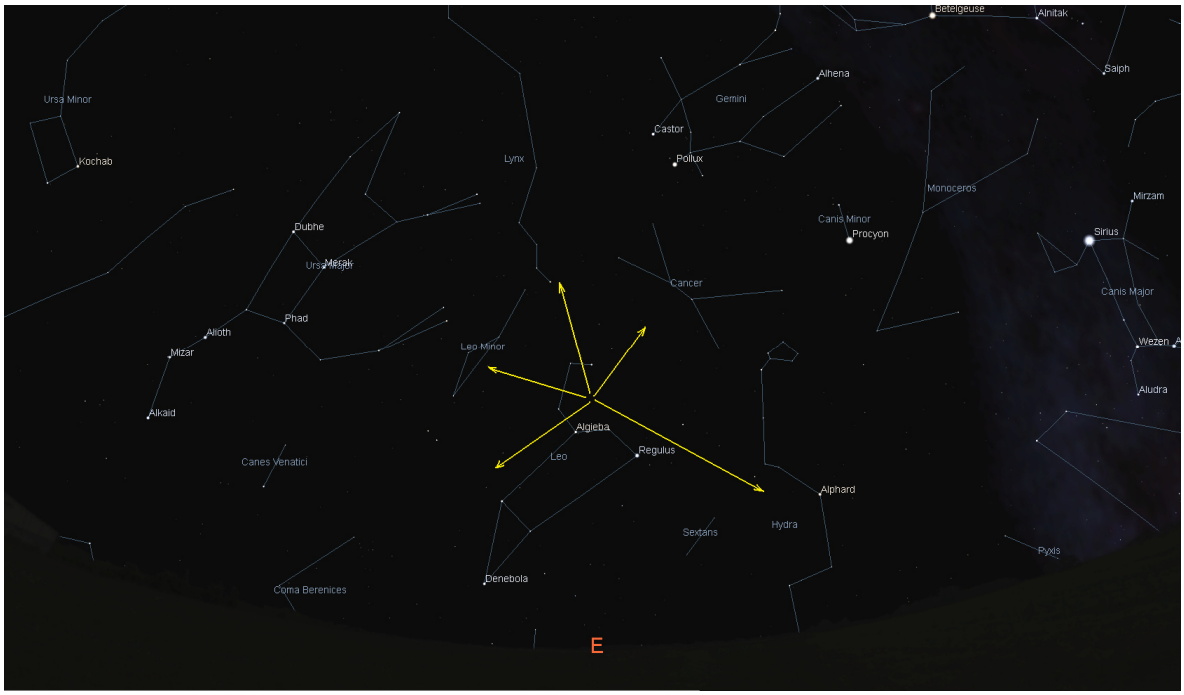
Northern Taurids (October 19th to December 10th)

The weak Northern Taurid Meteor Shower, with only 5 meteors per hour at the peak, is active from October 19th to December 10th annually, and peaks overnight on **November 11/12**. These are medium speed meteors derived from material left by periodic Comet 2P/Encke. They consist of larger than average grains and often produce colourful fireballs. During the peak, the radiant point is near the Pleiades in Taurus (RA 3:51:10, Decl. +21°57'30"). At the peak, the Moon will be 34% illuminated, and rises in the middle of the night, so evening viewing will be better.



Leonids (November 5th to 30th)

The Leonids peak overnight on **November 17/18**, when the radiant point (R.A. 10:10:00, Dec. +21° 47'30") is within the sickle forming the lion's head in the constellation Leo, which rises in the east around midnight. They are thought to be leftover material from Comet 55P/Tempel-Tuttle. Leonids are typically fast and bright, with many having persistent trains. The expected peak rate is approximately 15 per hour. A new moon will provide a dark sky for meteor watchers.



Asteroids

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

March 12, 2017 at 1:42am EDT Asteroid 2012 TC4 (12-24 metres across) passes within 0.13 Lunar Distances of Earth https://ssd.jpl.nasa.gov/sbdb.cgi?sstr=2012%20TC4

According to the Minor Planet Centre…

Near-Earth Objects Discovered This Year:	1338 (~157/month)
Minor Planets Discovered This Year:	20,435 (~2,405/month)
Comets Discovered This Year:	39 (~4.6/month)
Observations This Year:	12.9 million

Satellites

A GTA International Space Station evening pass series lasts until October 18 (Most are visible between 7:15 and 9:15 pm). Morning pass series commences on Oct 28 (Most are visible between 4:30 and 6 am). Some higher/brighter ones include*:

Date	Time	Direction	Alt.	Mag.
Thu, 12-Oct	7:35 pm to 7:40 pm	moves NW to ESE	62°	-3.7 !!
Sat, 14-Oct	7:27 pm to 7:33 pm	moves WNW to SE	62°	-3.4 !!
Wed, 1-Nov	6:56 am to 7:02 am	from WSW to NE	71°	-3.9 !!

*far future predicted times may shift slightly

Iridium Flares most frequent evening flares occur between 6:45 pm and 8:30 pm, with morning flares common from 6 to 7:45 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

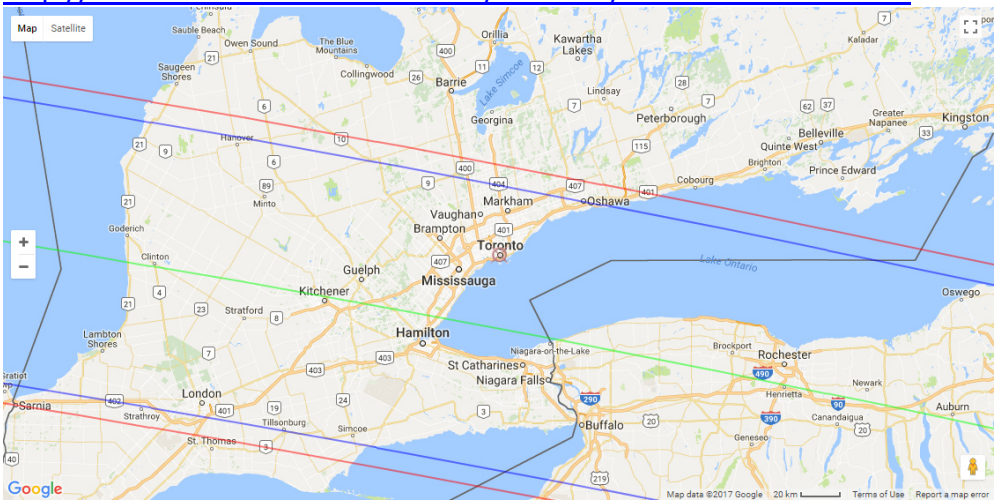
Ref: http://www.asteroidoccultation.com/ and http://www.poyntsource.com/New/Global.htm (additional links on the following URLs open track maps)

Lunar Occultations

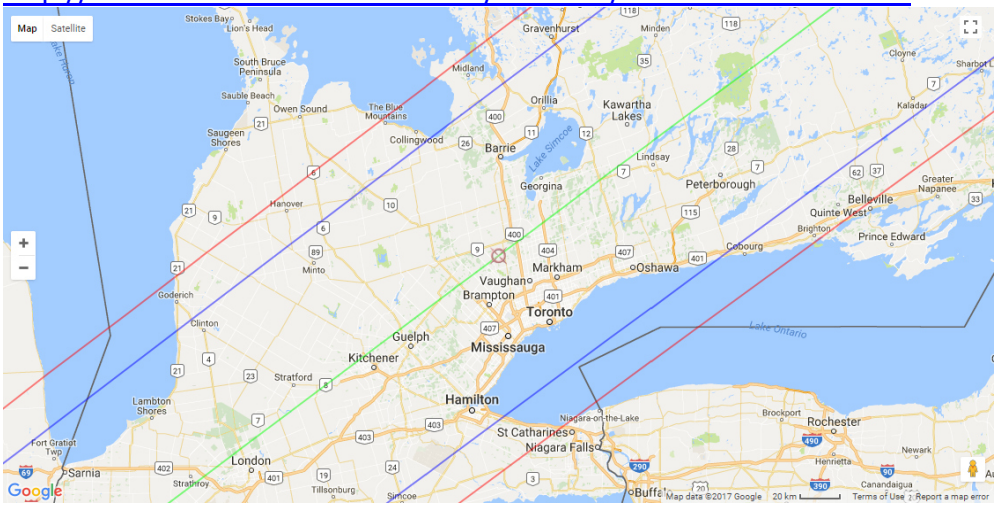
In the eastern pre-dawn sky on Sunday, October 15, much of North America will see the lit leading edge of the old crescent moon pass over the bright star Regulus. The star will reappear from behind the dark limb about an hour later. GTA observers will see the event start at 5:47 am and end in twilight at 6:33 am EDT.

On the evening of Sunday, November 5, the nearly full moon will occult the naked eye star Aldebaran for observers in North America (except the west coast), northern Europe, and northwestern Asia. For the GTA, at 8:05 pm EST, the moon's lit leading limb will cover Aldebaran. The star will emerge from the opposite dark limb at 9 pm.

Rank 100 - 25 Oct at 9:31 UT asteroid (111) Ate (mag 11.3) occults star TYC 1766-00900-1 (mag11.5), dips 0.65 mags for 13 seconds, alt 73° visible across Goderich, Kitchener, Rochester corridor. Star location is in Aries.
http://www.asteroidoccultation.com/2017_10/1025_111_51836.htm



Rank 99 - 12 Nov at 01:32 UT asteroid(545) Messalina (mag 14.1) occults star 2UCAC 27012288 (mag11.2) dips 3.02 mags for 6 seconds, alt. 58° visible across London, Newmarket, Lindsay corridor.
http://www.asteroidoccultation.com/2017_11/1112_545_51926.htm



Constellations near the Meridian (Annually in mid-Autumn)

8 pm: Capricornus, Aquila, W Aquarius, Equuleus, Delphinus, Sagitta, Vulpecula, Cygnus, Cepheus, E Draco
10 pm: Piscis Austrinus, Aquarius, W Pisces, Pegasus, Lacerta, Cepheus
12 am: Sculptor, W Cetus, Pisces, E Pegasus, Andromeda, Cassiopeia, Cepheus
2 am: Fornax, W Eridanus, E Cetus, Aries, Triangulum, Andromeda, Perseus, Cassiopeia, Camelopardalis

Observing Skylights (Annually in mid-Autumn)

For a change, check out some Caldwell Objects! (NB: Seeing all 110 requires southern hemisphere skies!)

Caldwell 6 (Cat'sEye Nebula)*	NGC6543	PN	Dra	()
Caldwell 7 (Fireworks Galaxy)	NGC2403	GL	Cam	()
Caldwell 13 (Owl / Dragonfly / ET Cluster)	NGC457	OC	Cas	()
Caldwell 14 (Double Cluster)	NGC884, 869	OC	Per	(eye / )
Caldwell 15 (Blinking Planetary)*	NGC6826	PN	Cyg	()
Caldwell 20 (North American Nebula)*	NGC7000	EN	Cyg	()
Caldwell 22 (Blue Snowball)*	NGC7662	PN	And	()
Caldwell 23 (Edge on Outer Limits Galaxy)	NGC891	GL	And	()
Caldwell 33, 34 (Veil Nebula)*	NGC6960, 6882	SN	Cyg	()
Caldwell 41 (Hyades)	Melotte 25	OC	Tau	(eye / )
Caldwell 43 (Mini Sombrero)	NGC7814	GL	Peg	()
Caldwell 44 (Barred Spiral Propeller Galaxy)	NGC7479	GL	Peg	()

*try with OIII or UHC Filter

See you at Long Sault C A, Bayview Village Park, or the CAO!

Questions or comments to chris.vaughan@astrogeo.ca
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