

RASC Toronto Centre – www.rascto.ca

The Sky This Month – November 12 to December 10, 2014

by Chris Vaughan

NEWS

Space Exploration – Public and Private

Ref. <http://www.spaceflightnow.com/tracking/index.html>

Launches

Nov 23 pm - Soyuz rocket from Baikonur Cosmodrome, Kazakhstan, payload manned Soyuz spacecraft to the ISS with new crewmembers. The capsule will remain at the station for about six months as crew escape pod.

Nov 27 pm - Proton rocket from Baikonur Cosmodrome, Kazakhstan, payload ASTRA 2G communications satellite for SES of Luxembourg.

Nov 29 pm - H-2A rocket from Tanegashima Space Center, Japan, payload Hayabusa 2 asteroid sample return mission. Hayabusa 2 will encounter asteroid 1999 JU3 in 2018 and return at least a gram of samples to Earth in December 2020.

Dec TBD - GSLV Mk.3 rocket from Satish Dhawan Space Center, Sriharikota, India, payload Geosynchronous Satellite Launch Vehicle Mk.3 will launch on a suborbital test flight.

Dec 4 am - Delta 4-Heavy rocket from Cape Canaveral, Florida, payload NASA's Orion multi-purpose crew vehicle on unmanned Exploration Flight Test-1. Spacecraft will reach 3,600 miles then re-enter the atmosphere to demonstrate the capsule's heat shield.

Dec 4 TBD - Ariane 5 rocket from ELA-3, Kourou, French Guiana, payload DirecTV 14 and GSAT 16 satellites.

December TBD - Long March 4B rocket from Taiyuan, China, payload CBERS 4 remote sensing sat (with Brazil).

Dec 9 pm - Falcon 9 rocket from SLC-40, Cape Canaveral Air Force Station, Florida, payload 7th Dragon spacecraft on the 5th operational cargo delivery mission to the ISS.

Dec 10 TBD - Soyuz rocket from Baikonur Cosmodrome, Kazakhstan, payload Resurs P2 Earth obs satellite.

Rosetta Update

The mission will ride the comet to perihelion and beyond! Orbiter is mapping the comet's surface, measuring gravity, mass, shape, and analyzing the coma and plasma. The 100 kg Philae Lander successfully made contact at 11 am on Nov 12, 2014 at the landing site, named Agilkia, located on the front end of the comet. Apparently, the ice-screws to drill/sample comet and harpoons to latch on did not deploy properly and the spacecraft bounced across the surface. Follow ESA for more news.

Comet Siding Spring at Mars

On October 19, 2014 the seven spacecraft in orbit around Mars had a front row seat for the close passage of Comet Siding Spring at a speed of 55 km per second (198,000 kph) and within approximately 132,000 km of the planet. Several of them were instructed to gather data. Of them, Mars Reconnaissance Orbiter, MAVEN, and Mars Express all imaged the comet and took readings. A meteor shower was produced and the immediate effects measured. MAVEN took the first direct samples of an Oort Cloud comet's dust. The comet covered only one pixel in the Mars Curiosity rover image, but the older Opportunity rover captured a very nice image!

New Horizons Mission to Pluto-Charon

The New Horizons spacecraft is scheduled to fly through the Pluto-Charon system on July 14, 2015, travelling approx. 13.78 km per second (49,600 kph). The Pluto-and-moons system will be approximately face-on, so

close attention will be placed to “thread the needle” up to the last days of approach. Radio signal travel times are more than 4 hours one-way.

The spacecraft’s post-Pluto vector is into the distant Kuiper Belt (KB), towards Sagittarius. Even before it was launched in 2006, it was assumed that more distant KBOs would have been discovered as targets for subsequent flybys. Years of ground based searching had found no candidate objects, so during the summer of 2014, the HST was enlisted. Five candidates were found. A second observing period from Aug through Oct permitted one to be confirmed. The object, designated PT1, will be passed in January, 2019. PT1 is a 30-45 km diameter primordial object (never been jostled by Neptune) at a distance of 43.4 AU. Sufficient fuel stores allow the spacecraft to be targeted as close as investigators wish!

This Month in History (a sampling)

Ref. <http://astroplanet.org/next.php>, <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>

Astro-Birthdays and Milestones

Nov 09 - Carl Sagan's 80th Birthday (1934) American astronomer, planetary scientist, author, science evangelist

Nov 12 - Audouin Dollfus' 90th Birthday (1924) French astronomer and aeronaut, discoverer of Saturn's moon Janus when rings were edge on

Nov 15 - Dirk Klinkenberg's 205th Birthday (1709), Dutch amateur astronomer, comet hunter

Nov 17 - Claes-Ingvar Lagerkvist's 70th Birthday (1944) Swedish astronomer, spin properties of minor planets, discoverer of comets and asteroids

Nov 20 - Edwin Hubble's 125th Birthday (1889-1953) American astronomer, expert in extra-galactic astronomy and the expansion of the Universe

Nov 24 - Carolyn Hurless' 80th Birthday (1934-1987) Prolific American AAVSO member, with 78,876 observations

Nov 26 - Auguste Charlois' 150th Birthday (1864-1910) French astronomer, discoverer of 99 asteroids

Dec 03 - Robert G Harrington's 110th Birthday (1904) American astronomer at Palomar who discovered comets, asteroids

Astronomy and Space Exploration

Nov 14 - 45h Anniversary (1969), Apollo 12 Launch

Nov 18 - 25th Anniversary (1989), COBE Launch

Nov 20 - 10th Anniversary (2004), Swift Telescope Launch, Gamma Ray Bursts and X-Ray, UV source maps

Nov 24 - 375th Anniversary (1639), 1st Observations of a Transit of Venus by Horrocks and Crabtree

Nov 28 - 50th Anniversary (1964), Mariner 4 Launch (Mars Flyby Mission)

Dec 02 - 40th Anniversary (1974), Pioneer 11, Jupiter Flyby

Dec 03 - 110th Anniversary (1904), Charles Perrine's Discovery of Jupiter's moon Himalia

Star Parties, etc.

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

“RASC Dark Skies Observing”, Long Sault Conservation Area, ON – window opens November 17

“RASC City Skies Observing”, Bayview Village Park, Toronto – window opens December 1

“RASC Solar Observing”, Ontario Science Centre Teluscape – Saturday 10-noon, December 6

“2014 Chiefland Fall Star Party”, Chiefland, Florida – Nov 17-23 (<http://www.fallstarparty.com/fall.html>)

OBSERVING

Globe at Night 2014

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 August campaign focus is on **Perseus** from November 12-21.

Sunrise/Sunset

November 12, sunrise at 7:10 am, sunset at 4:54 pm (9h44m of daylight)

December 10, sunrise at 7:43 am, sunset at 4:39 pm (8h56m of daylight)

Moon - Orbit

Apogee – Fri., Nov 14 at 9 pm

Perigee – Thu., Nov 27 at 6 pm

Apogee – Fri., Dec 12 at 6 pm

Moon - Phases

Fri., Nov 14 at 10:15 am – Last Quarter Moon (rises around midnight)

Sat., Nov 22 at 7:32 am – New Moon

Sat., Nov 29 at 5:06 am – First Quarter Moon (sets around midnight)

Sat., Dec 6 at 7:27 am – Full “Cold/Long Nights” Moon

Moon - Conjunctions

On **November 14th** before dawn, the Last Quarter Moon will sit 6° to the southwest (right) of Jupiter. Photo op!

On **November 21st** before dawn, the very old crescent Moon (1% illum.) will sit approximately 2.5° above (northwest of) Mercury. A difficult target from 6:30 am to sunrise.

On **November 25th** in early evening, the Young Moon (14% illum.) sits about 8° to the northwest (right) of Mars. Less than 10° northeast of Mars the following evening.

On **November 28th** in evening, the First Quarter Moon (45% illum.) sits about 6° to the west (right) of Neptune.

On **December 1st** at 6 pm, the nearly Full Moon (77% illum.) sits only 10 arc-minutes to the southeast of (above) Uranus. Photo op?

On the evening of **December 5th**, the Full Moon will traverse the Hyades. Near midnight, it will pass about 1° from Aldebaran. Binocular/Photo op!

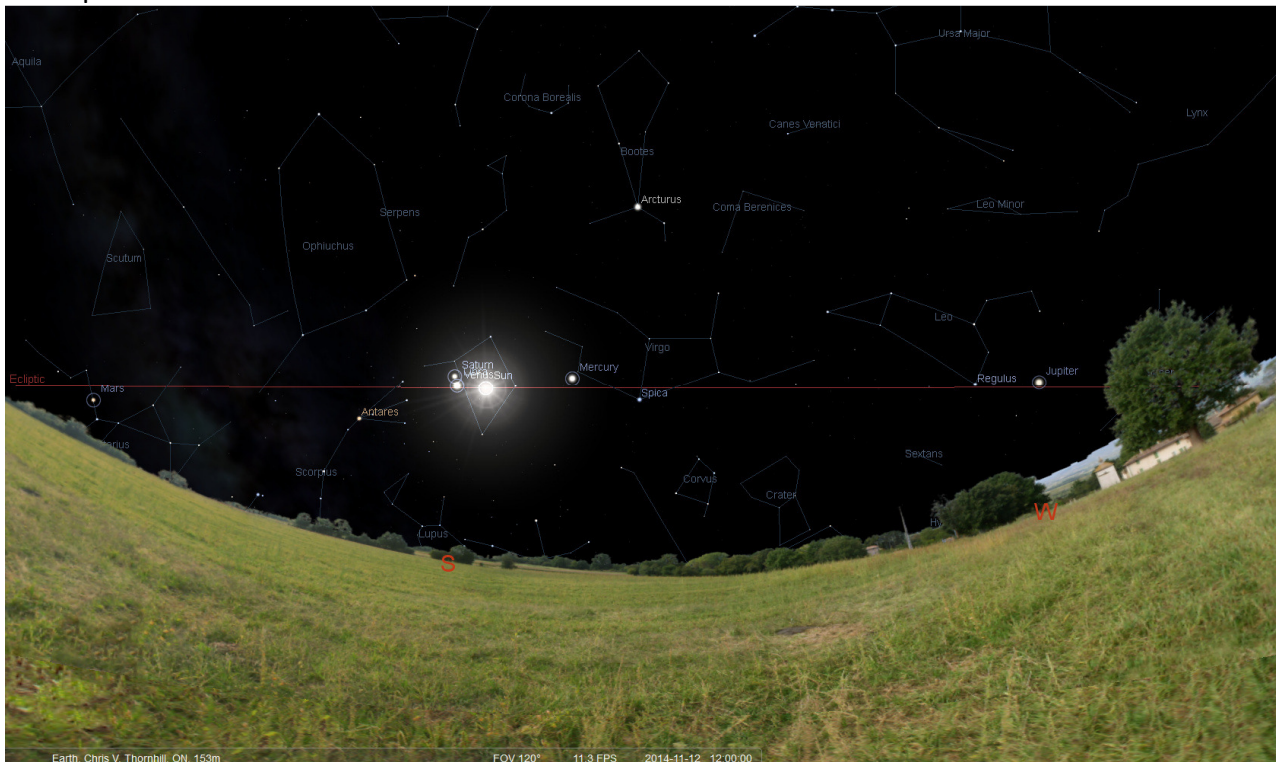
Planets and Dwarf Planets

Mercury is completing a favorable morning apparition and descending into the dawn’s glare. On November 12, it rises at 5:59 am (mag -0.7), and may be observed with increasing difficulty for another 10 days or so. On December 8, it experiences superior conjunction. On **November 21st** before dawn, the very old crescent Moon (1% illum.) will sit approximately 2.5° above (northwest of) Mercury. A difficult target from 6:30 am to sunrise.

Venus was in superior conjunction in late October and has recently begun to climb out of the sunset’s glare. Due to the shallow evening Ecliptic, its daily motion is nearly horizontal. It will become observable low in the SW dusk sky from mid-December.

Mars continues to be observable low in the southwestern sky after dusk. Over the next month, it continues to recede and shifts eastward from Sagittarius into Capricornus, setting at 8:09 pm on November 12th (mag +1.1) and (still) at 8:09 pm (mag +1.2) on Dec 10th. On December 3rd, Mars will pass only 15 arc-minutes to the north of the globular cluster Messier 75. On **November 25th** in early evening, the Young Moon (14% illum.) sits about 8° to the northwest (right) of Mars. The Moon will still sit less than 10° northeast of Mars on the following evening.

Jupiter, in western Leo all month, rises at 11:27 pm on November 12th (mag -1.7) and at 9:43 pm (mag -1.9) on December 10th. On **November 14th** before dawn, the Last Quarter Moon (53% illum.) will sit 6° to the southwest (right) of Jupiter. Photo op! There is a double shadow transit (opposite limbs) on December 8th at 11:22 pm.



Saturn is in Libra all month, unobservable due to conjunction on November 18th. It will start to become observable in the morning sky at the end of November. On December 10th, it will rise at 5:58 am (mag 0.7).

Uranus (mag 6.1) is moving retrograde (west) in Pisces all month, and is well positioned for observing in evening. On November 12th it sets at 3:59 am, and on December 10th it sets at 2:06 am. On **December 1st** at 6 pm, the nearly Full Moon (77% illum.) sits only 10 arc-minutes to the southeast of (above) Uranus. Photo op?

Neptune, (mag 7.6) is an early evening target in Aquarius in the southwestern sky. On November 16th it becomes stationary and resumes prograde motion. It sets at 12:39 am on November 12th and sets at 10:50 pm on December 10th.

Pluto, north of Sagittarius' teapot, a faint mag 14.2 object, sets at 8:18 pm on November 12th and at 6:32 pm on December 10th.

Vesta and **Ceres** are north of Scorpius and unobservable.

Comets

Ref <http://www.aerith.net/comet/weekly/current.html>, <http://cometchasing.skyhound.com/>, <http://in-the-sky.org/comets.php>

No bright comets

Meteor Shower(s)

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

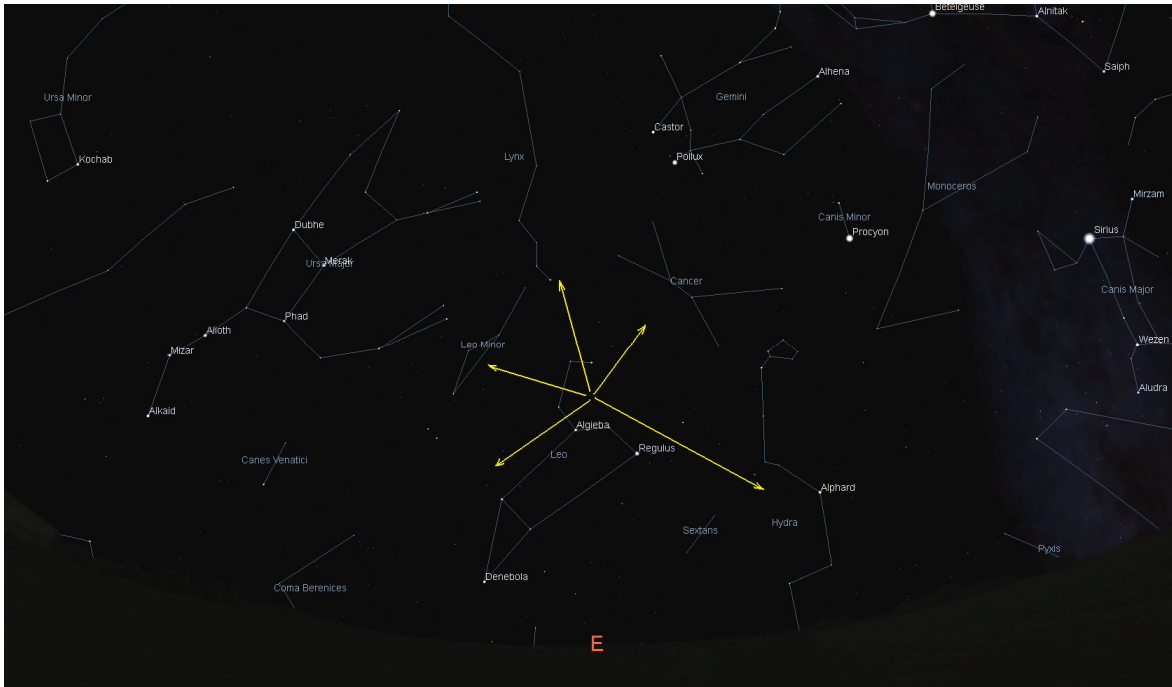
Northern Taurids (October 19th to December 10th, 2014)

The Northern Taurids peak overnight on November 12/13 and are medium speed meteors derived from material left by Comet 2P/Encke. They consist of larger than average grains and often produce fireballs, but at a peak rate of only 5 per hour. The radiant point is near The Pleiades in Taurus (RA 4h 00m, Decl. +22°). The Moon will be waning gibbous, and rises in mid-evening.



Leonids (November 5th to 30th, 2014)

The Leonids peak overnight on November 17/18. The radiant point 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. The very old Moon will not interfere to a great degree.



Geminids (December 4th to 16th, 2014)

The Geminids, usually the strongest shower of the year, peak overnight on December 13/14. The peak rate is 100-120 meteors per hour. The radiant is near Castor (RA 7h 28m, Decl. +33°). This year the radiant has risen by dusk and the waning gibbous Moon doesn't rise until midnight, giving several hours of peak viewing opportunity. The Geminids are generally medium-slow, often bright and intensely coloured, without persistent trails. Source material is thought to be asteroid 3200 Phaethon and not a comet. This means that the debris is likely larger and more solid – giving us a better show!



Asteroids

Ref: <http://neo.jpl.nasa.gov/ca/>, <http://www.minorplanetcenter.net/>

According to the Minor Planet Centre...

Near-Earth Objects Discovered This Year: 1132 (~109/month)
Minor Planets Discovered This Year: 65,298 (~6285/month)
Comets Discovered This Year: 45 (~4.3/month)

November 18 - Asteroid 214088 - 2004 JN13 (2.5-5.7 km) will pass within 53 Lunar Distances, peak mag. 15.1
November 18 - Asteroid 85713 - 1998 SS49 (1.9-4.3 km) will pass within 74 Lunar Distances, peak mag. 15.7
November 22 - Asteroid 393908 - 2005 UH3 (0.8 - 1.8 km) will pass within 45 Lunar Distances, peak mag. 17.6
December 22 - Asteroid 345705 - 2006 VB14 (0.5 - 1.2 km) will pass within 59 Lunar Distances, peak mag. 18.5

Satellites

Current GTA International Space Station morning pass series runs until Nov 29th (Most are visible between 5 to 6:30 am). Evening passes commence on Dec 6th. Some higher/brighter ones include*:

Date	Mag.	Time	Direction	Alt.
12-Nov	-3.0	6:15:31 am to 6:21:49 am	from WSW to NE	51°
13-Nov	-3.4	5:28:34 am to 5:32:20 am	from WSW to ENE	80°
23-Nov	-3.3	6:50:32 am to 6:57:09 am	from WNW to SE	86°
26-Nov	-3.2	5: 59:42 am to 6:04:05 am	from W to SE	60°
9-Dec	-2.9	6:14:14 pm to 6:17:54 pm	from SW to ESE	45°

*far future predicted times may shift slightly

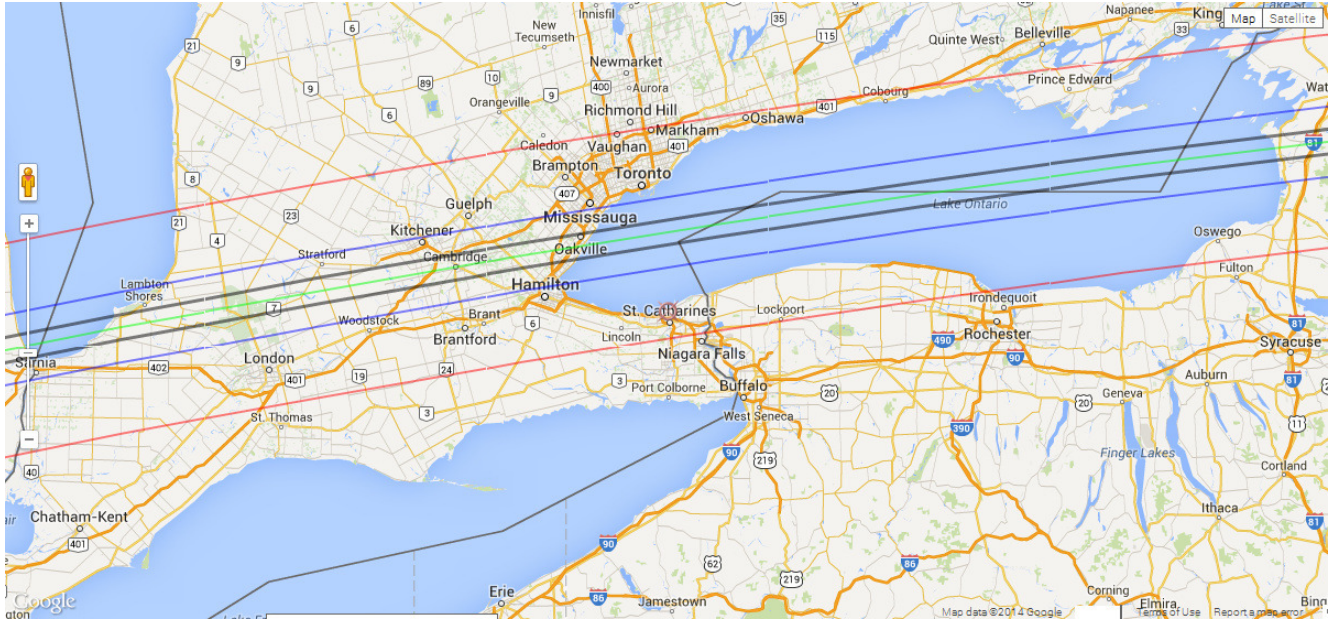
Iridium Flares most frequent evening flares occur between 5:30 pm and 6:30 pm, with morning flares common from 5:30 to 6:30 am. Local occurrences info at www.heavens-above.com and enter your location, from phone/tablet apps, Chris Vaughan's Skylights (subscribe to email [here](#) or visit www.astrogeoguy.tumblr.com)

Occultations

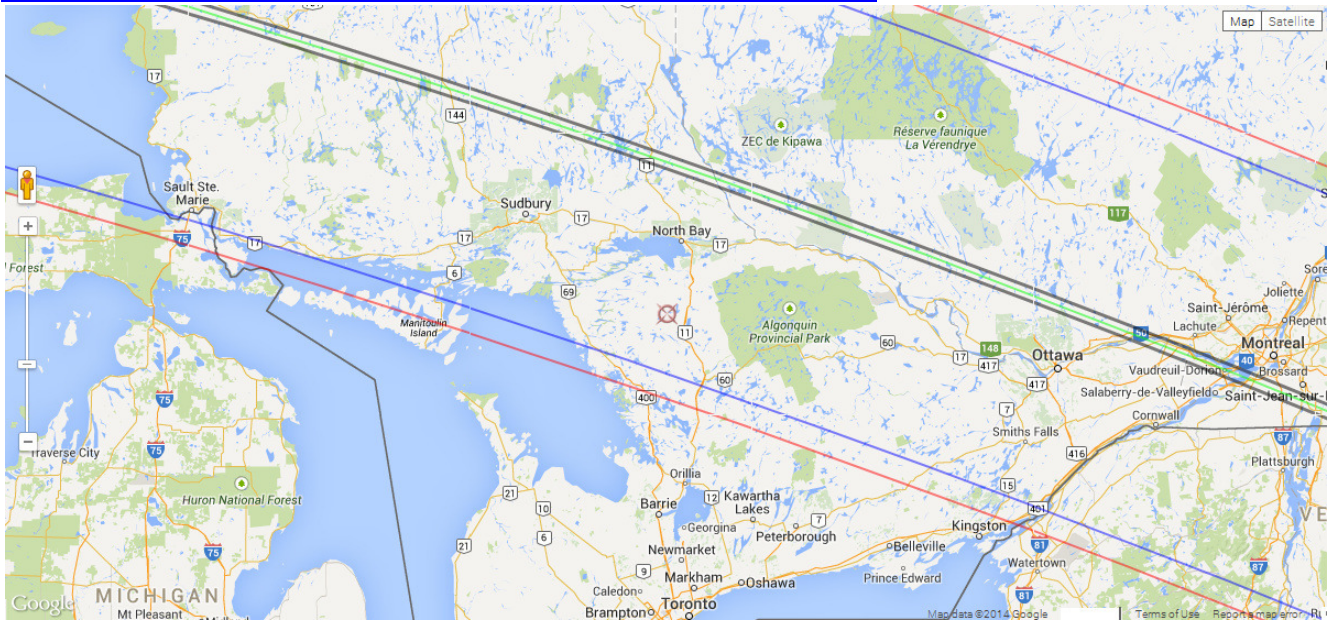
Ref: <http://www.asteroidoccultation.com/> and <http://www.poyntsource.com/New/Global.htm> (additional links on the following URLs open track maps)

Thanks to Guy Nason for these recommendations! The precise occultation times for your observing location can be obtained from Occult Watcher software or from the IOTA page. In the maps below, the predicted path is BLUE, with the centre line GREEN.

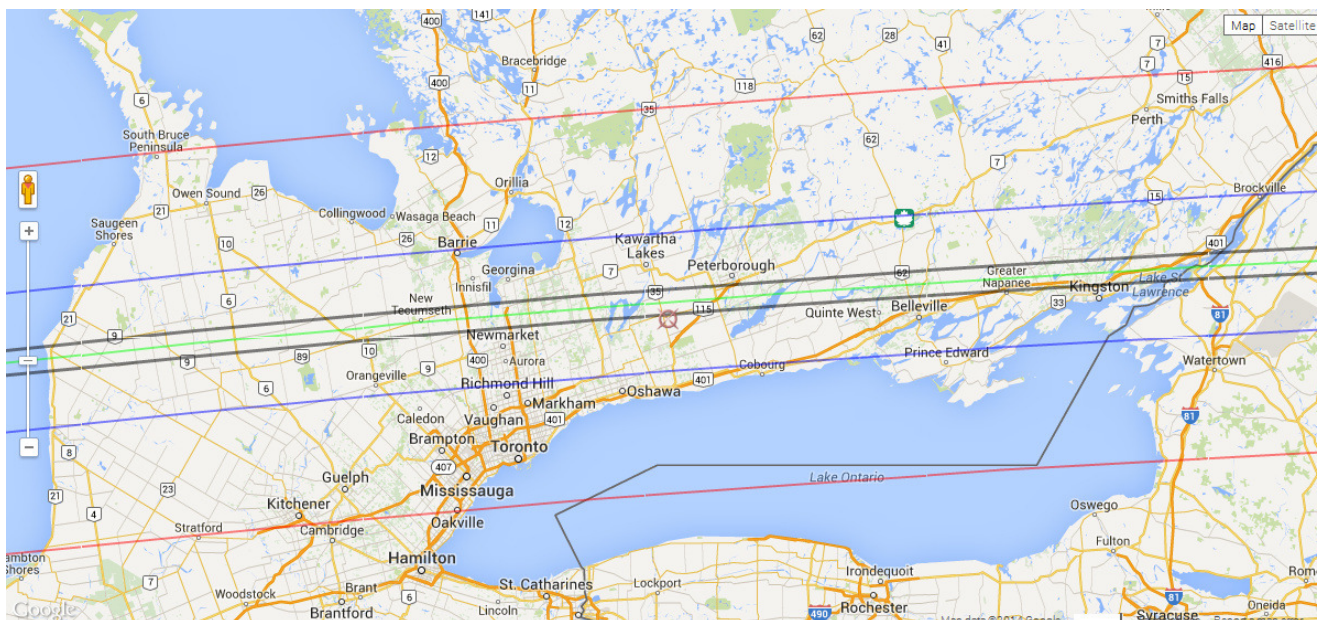
Rank 61 – Thursday, Nov. 13 at 11:28 pm, Asteroid (1659) Punkaharju (mag 12.9) occults star TYC 3334-01146-1 (mag 10.2), E-W track from N. Scotia, over Oakville, Cambridge, St. Marys, to N. Baja, drops 2.8 mags for 3.4 seconds, alt. 84° http://www.asteroidoccultation.com/2014_11/1114_1659_33750.htm



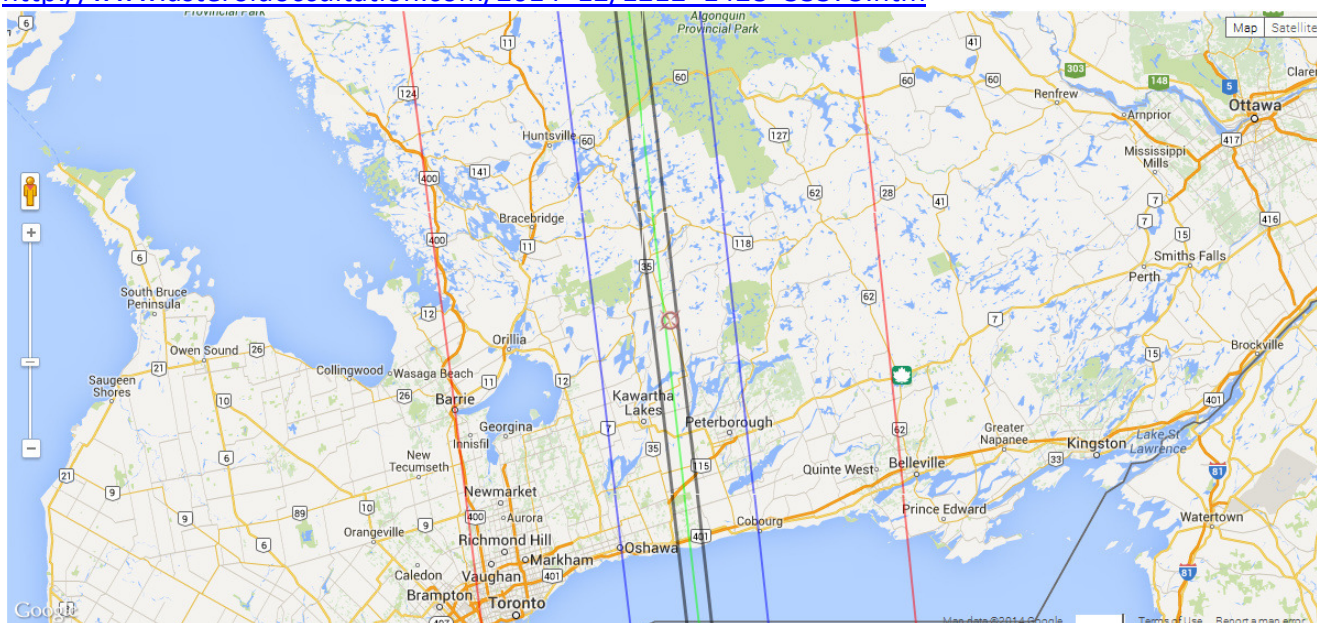
Rank 100 – Thursday, Nov. 20 at 1:57 am, Asteroid (3) Juno (mag 9.1) occults star HIP 43357 (mag 7.4), E-W track across L. Superior/Georgian Bay north shores and Montreal, drops 1.9 mags for 27.2 seconds, alt. 69° http://www.asteroidoccultation.com/2014_11/1120_3_33271.htm



Rank 67 – Monday, Nov. 24 at 2:40 am, Asteroid (374) Burgundia (mag 13.0) occults star TYC 0647-00433-1 (mag 11.3), E-W track across N. Scotia, Keswick to Gananoque, to central Calif., drops 1.9 mags for 4.1 seconds, alt. 75° http://www.asteroidoccultation.com/2014_11/1124_374_33294.htm



Rank 60 – Friday, Dec. 12 at 3:42 am, Asteroid (1428) Mombasa (mag 15.2) occults star TYC 1405-01528-1 (mag 9.3), N-S track from James Bay, over Oshawa, to Bahamas, drops 5.9 mags for 9.3 seconds, alt. 84°
http://www.asteroidoccultation.com/2014_12/1212_1428_33375.htm



Constellations near the Meridian (Annually in Late November)

7 pm: Sculptor, Piscis Austrinus, Aquarius, Pegasus, Lacerta, and Cepheus

9 pm: Sculptor, Cetus, Pisces, Andromeda, Triangulum, and Cassiopeia

11 pm: Fornax, Eridanus, Cetus, Taurus, Aries, Perseus, Triangulum, and Camelopardalis

Interesting Targets in the Cetus, Pisces, Aries, Triangulum, Andromeda Region

The evening southern sky in late November lacks much pizzaz, but there are many interesting objects to look at. Cetus and Pisces are well away from the Galactic Plane and contain few clusters, but many galaxies. (the symbol “ represents an angular measurement in arc-seconds or 1/3600 degree. The Moon is 30’ across)

Sculptor

Caldwell 65 (aka NGC 253, Sculptor Galaxy, Silver Dollar Galaxy) – bright, mag 7.1, large (~ one lunar diameter) intermediate spiral galaxy oriented close to edge on (at 25 degrees alt around 9:30 pm, a bit low)

Cetus

Mira (aka omicron Ceti) - first Mira-type star, a pulsating red giant variable discovered in 1596. Mass transfer between the primary star and white dwarf companion, Mag 2.0 to 10.1 over 331 days (currently fading at ~mag 8.5, next maximum around April, 2015). Light curve at http://www.aavso.org/lcg/plot?aid=000-BBD-706&starname=MIRA&lastdays=365&start=&stop=2456975.12516&obscode=&obscode_symbol=2&obstotals=yes&calendar=calendar&forcetics=&grid=on&visual=on&uband=on&bband=on&v=on&pointsize=1&width=800&height=450&mag1=&mag2=&mean=&vmean= Mira's proper motion has produced a bow shock and train that have been imaged.

Tau Ceti (aka τ Cet, Durre Menthor) – at mag 3.5, 2nd closest Sunlike star (11.9 ly). It has a high proper motion (2' per annum). It was an original SETI search target for Project Ozma. Recently, a possible exo-planet system detected. Popular in fiction – including novels by Niven, Herbert, Delany, Heinlein, Le Guin, Sawyer, and the exile home of Star Trek's Wrathful Khan!

Kaffaljidhina (aka Gamma Ceti) – tight double (sep 2.3") pale blue and yellow, mag 3.6 / 6.6

Caldwell 56 (aka NGC 246, Skull Nebula) – Planetary nebula in Cetus, approx. 3.8 minutes across, mag 8.0

Messier 77 (aka NGC 1068) – mag 9.0 Seyfert-type face on barred spiral galaxy with active star-like nucleus and radio source called Cetus A, likely a 10M solar mass black hole. (60 mly)

Pisces

Al Rischa (aka alpha Piscium, The Knot) – pale Blue / Green close double (sep. 1.8") mag 4.3 / 5.2

Zeta Piscium (ζ Psc) – optical double star (sep 23") pale yellow / lilac mag 5.2 / 6.2 (~10° east of Uranus)

Eta Piscium (aka Kullat Nunu) – brightest star in Pisces, challenging close double (1") mag 3.8

19 Psc (aka TX Piscium) – One of the reddest stars known (a carbon star), pulsating variable, mag 4.9-5.5

Messier 74 (aka NGC 628) – face on spiral galaxy, similar in structure to the Milky Way, low surface brightness, (~10 arc-minutes across) mag 9.2 (imaged by Mortfield and Kupke)

Aries

Mesarthim (aka γ Arietis, 5 Ari) – variable, close double star, white and white (sep 7.5"), mag 4.6 / 4.7

Triangulum

6 Trianguli (aka TZ Tri, Struve 227, Iota Tri) – variable double star with strong Yellow / Blue colour (sep 3.8"), mag 5.8 / 6.4

Messier 33 (aka NGC 598, Triangulum Galaxy) – Large (42 by 69 arc-minutes!) local spiral galaxy, visible with naked eyes in dark skies, binoculars, and low magnification in scopes, mag 5.7

Pegasus

51 Pegasi – yellow Sunlike star 51 ly away, naked eye object, mag 5.5. First known exoplanet, 51 Pegasi b, discovered in 1995 (radial velocity measurement). Hot Jupiter now called Bellerophon

Andromeda

Almaak (aka Almach, Gamma And, 57 And) – easy Orange / Blue-green double (sep 9.8"), mag 2.2 / 5.0

Messier 31 (aka Andromeda Galaxy) – Of course! Large spiral galaxy (6 Moon diameters across!), with Messier 32 and Messier 110

Blue Snowball (aka NGC 7662, Caldwell 22) – Planetary nebula about 20 by 130 arc-seconds, mag 9.0

Come out to Long Sault C A, Bayview Village Park, CAO, or DDO!