# RASC Toronto Centre - www.rascto.ca The Sky This Month - January 28 to February 25, 2015 <br> by Chris Vaughan 

## NEWS

## Space Exploration - Public and Private

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

## Launches

Jan 28 at 8-10 pm - H-2A rocket from Tanegashima Space Center, Japan, payload radar reconnaissance sat. Jan 29 am - Delta 2 rocket from SLC-2W, Vandenberg Air Force Base, California, payload Soil Moisture Active Passive sat.
Feb 1 am - Proton rocket from Baikonur Cosmodrome, Kazakhstan, payload Inmarsat 5 F2 comsat.
Feb 1 TBD - Soyuz 2-1v rocket from Plesetsk Cosmodrome, Russia, payload Kanopus ST Earth observation sat.
Feb 8 pm - Falcon 9 rocket from SLC-40, Cape Canaveral Air Force Station, Florida, payload Deep Space Climate Observatory for U.S.A.F, NOAA and NASA (to Lagrange 1).
Feb 11 am - Vega rocket from ZLV, Kourou, French Guiana, payload ESA's Intermediate Experimental Vehicle, or IXV on a suborbital trajectory, testing advanced flight control and re-entry technologies.
Feb 17 am - Soyuz rocket from Baikonur Cosmodrome, Kazakhstan, payload 58th Progress cargo delivery to ISS. Feb 17 TDB - Falcon 9 rocket from SLC-40, Cape Canaveral Air Force Station, Florida, payload Eutelsat 115 West B and ABS 3A comsats.
Feb TDB - Dnepr rocket from Dombarovsky, Russia, payload Kompsat 3A high-resolution Earth observation sat for Korea.

## 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 is awake and healthy.

## DAWN to Ceres

The ion-drive equipped DAWN spacecraft is on track to enter orbit around the dwarf planet Ceres on March 6, 2015. It will remain in orbit to map the round world in detail. Using its small framing camera, the spacecraft on Jan $25^{\text {th }}$ snapped a series of frames of Ceres from a distance of $237,000 \mathrm{~km}$. These already show better detail than our best Hubble images to date.

## Rosetta Update

Rosetta Orbiter is still mapping the comet's surface, classifying surface morphologies, measuring gravity, mass, shape, and analyzing the coma and plasma. Five basic categories of terrain type have been determined: dustcovered; brittle materials with pits and circular structures; large-scale depressions; smooth terrains; and exposed more consolidated ('rock-like') surfaces. Jets have been observed emanating from the neck area and from circular pits. Dust is carried aloft or remobilized by the jets. Any material without escape velocity falls to surface and forms dunes, etc. The interior of the comet is $70-80 \%$ empty space - likely a "foam-like" matrix of dusty ice. Primordial Organic Compounds, mainly carboxylic acids have been detected on the surface. The fate of little Philae is still uncertain.
$\rightarrow$ COMET 67P/CHURYUMOV-GERASIMENKO'S VITAL STATISTICS


## 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

## Astro-Birthdays and Milestones

Jan 28, 1608 - Giovanni Alfonso Borelli, Naples, mathematician/astronomer
Jan 28, 1611 - Johannes Hevelius, Danzig, astronomer, star cataloger
Feb 4, 1906 - Clyde Tombaugh, discoverer of Pluto in 1930
Feb 7, 1824 - Sir William Huggins, pioneer of stellar and nebula spectroscopy
Feb 14, 1898 - Fritz Zwicky, Swiss Astronomer, supernova expert
Feb 15, 1564 - Galileo Galilei, renaissance man, astronomer
Feb 15, 1858 - William Pickering, American Astronomer, moons of Saturn
Feb 19, 1473 - Nicholas Copernicus, revolutionary author of "On the Revolution of the Heavenly Spheres"
Feb 20, 1945 - George Smoot, American Nobel Prize winning astrophysicist, cosmologist (COBE)

Jan 28, 1986 - Shuttle Challenger explodes shortly after liftoff
Jan 31, 1862 - Alvin Clark discovers Sirius B (the Flea)
Feb 1, 1949 - First Light for the 200" ( 5.08 -m) Hale telescope
Feb 1, 2003 - Space Shuttle Columbia breaks up on re-entry over Texas. All seven lives are lost.
Feb 4-9, 1971 - Apollo 14 mission
Feb 9, 1497 - Nicolaus Copernicus observed the occultation of Aldebaran by the Moon
Feb 10, 1720 - Edmund Halley named 2nd Astronomer Royal of England
Feb 18, 1930 - Clyde Tombaugh discovers Pluto
Feb 19, 1986 - USSR launches MIR
Feb 20, 1994-20th Anniversary of Clementine Moon Orbit Insertion
Feb 24, 1968 - Jocelyn Bell at Cambridge announces the first pulsar PSR1919+21 near Sagitta
Star Parties, etc.
Ref: http://ontariostargazing.ca/astronomy-star-party-and-astronomy-events-listing-for-canada/, http://www.amsky.com/calendar/events/\#may, http://stardate.org/nightsky/star parties
"RASC Solar Observing", Ontario Science Centre Teluscape - Saturday 10-noon, February 7 (or Feb 14?)
"RASC Dark Skies Observing", Long Sault Conservation Area, ON - window opens February 16
"RASC City Skies Observing", Bayview Village Park, Toronto - windows open January 26 and February 23
"Southern Cross Astronomical Society Winter Star Party", Florida Keys, Florida - Feb 16 to 22 (http://scas.org/winter-star-party/)
"Orange Blossom Special International Star Party", Tampa Bay, Florida - Feb 11 to 15
(http://www.stpeteastronomyclub.org/obs.php)

## OBSERVING

## Globe at Night 2015

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 next campaign focus is on Orion from February 9-18.

## Sunrise/Sunset

January 28, sunrise at 7:41 am, sunset at 5:22 pm (9h41m of daylight)
February 25, sunrise at 7:03 am, sunset at 6:00 pm (10h57m of daylight)

## Moon - Orbit

Apogee - Fri., Feb 6 at 1 am
Perigee - Thu., Feb 19 at 2 am (large tides)

## Moon - Phases

Mon., Jan 26 at 11:48 pm - First Quarter Moon (sets around midnight)
Tue., Feb 3 at 6:09 pm - Full "Snow/Hunger" Moon
Wed., Feb 11 at 10:50 pm - Last Quarter Moon (rises around midnight)
Wed., Feb 18 at 6:47 pm - New Moon

## Moon - Conjunctions, etc.

February $3^{\text {rd }}$ evening, the Full Moon is less than $6^{\circ}$ south (to lower right) of Jupiter. February $\mathbf{1 2}^{\text {th }}$ and $\mathbf{1 3}^{\text {th }}$ predawn, the waning crescent Moon is $8^{\circ}$ west (to upper right) and $5^{\circ}$ east (to lower left) of Saturn respectively. February $\mathbf{1 7}^{\text {th }}$ before sunrise, the old crescent Moon ( $3.4 \%$ illum) sits $5^{\circ}$ northeast (to left) of Mercury ( $45 \%$ illum). February $\mathbf{2 0}^{\text {th }}$ after sunset to $8: 20 \mathrm{pm}$, the waxing crescent Moon ( $5.5 \%$ illum) is less than $2^{\circ}$ southwest (to the right) of Venus and Mars. Photo op! February 21 ${ }^{\text {st }}$ early evening, the waxing crescent Moon (12\% illum) occults Uranus (mag 6.4) from 5:50 pm to 6:45 pm. February $25^{\text {th }}$ early evening, the First Quarter Moon passes about 35 arc-minutes north of Aldebaran. Closest around 6 pm in twilight.

## Planets and Dwarf Planets

Mercury, after inferior conjunction on January $30^{\text {th }}$, becomes observable before dawn from February $6^{\text {th }}$, and reaches greatest western elongation on February $24^{\text {th }}$, when it rises at 5:56 am (mag 0.3 ). On February $17^{\text {th }}$ the old crescent Moon ( $3.4 \%$ illum) sits $5^{\circ}$ northeast (to left) of Mercury ( $45 \%$ illum), visible with difficulty from 6 am to sunrise.

Venus is climbing away from the Sun in the low WSW evening sky all month (moving from Aquarius into Pisces). On January 28th, it sets at 7:19 pm (mag -3.3 and 92\% illum) and on February 25th it sets at 8:31 pm (mag -3.4 and $87 \%$ illum). On the evening of February 1st it sits approximately $0.8^{\circ}$ south (to the left) of magnitude 7.8 Neptune. On February 20th after sunset to $8: 20 \mathrm{pm}$, the waxing crescent Moon ( $5.5 \%$ illum) is less than $2^{\circ}$ southwest (to the right) of Venus, with Mars only $0.8^{\circ}$ above Venus. Photo op! On February 21st, Venus sits only 25 arc-minutes south (to the lower left) of Mars.

Mars continues to be observable low in the southwestern sky after dusk. Over the next month, it continues to recede and shifts eastward from Aquarius into Pisces, setting at $8: 16 \mathrm{pm}$ on January $28^{\text {th }}$ (mag +1.4 ) and (still) at $8: 19 \mathrm{pm}$ (mag +1.5 ) on February $25^{\text {th }}$. On February $20^{\text {th }}$ after sunset to $8: 20 \mathrm{pm}$, the waxing crescent Moon ( $5.5 \%$ illum) is less than $3^{\circ}$ west (to the lower right) of Mars, which itself is only $0.8^{\circ}$ above Venus. Photo op! On February $21^{\text {st }}$, Venus sits only 25 arc-minutes south (to the lower left) of Mars.

Jupiter, magnitude -2.1, is well placed for observing - sitting in western Leo nearly all month, then shifting into Cancer. It rises at 6:05 pm on January $28^{\text {th }}$, reaches opposition on February $6^{\text {th }}$ (with a 45 arc-second diameter), and rises at $3: 56 \mathrm{pm}$ on February $25^{\text {th }}$. On the evening of February $3^{\text {rd }}$, the Full Moon is less than $6^{\circ}$ south (to lower right) of Jupiter.

Saturn is in Scorpius all month, observable in the eastern morning sky. On January $24^{\text {th }}$ it rises at 3:08 am (mag 0.74 ) and on February $25^{\text {th }}$, it will rise at $1: 29$ am (mag 0.66 ). In the pre-dawn of February $12^{\text {th }}$ and $13^{\text {th }}$ the waning crescent Moon sits $8^{\circ}$ west (to upper right) and $5^{\circ}$ east (to lower left) of Saturn respectively.

Uranus (mag 6.2) is in Pisces all month, and is well positioned for observing in early evening. On January $28^{\text {th }}$ it sets at $10: 56 \mathrm{pm}$, and on February $25^{\text {th }}$ it sets at $9: 09 \mathrm{pm}$. On February $21^{\text {st }}$ the waxing crescent Moon ( $12 \%$ illum) occults Uranus (mag 6.4) from 5:50 pm to 6:45 pm.

Neptune, in Aquarius all month (mag 7.8) is only observable low in the southwestern sky in early evening until early February. On February $1^{\text {st }}$, it sits about $0.8^{\circ}$ northwest (to the right) of Venus. It reaches conjunction on February $26^{\text {th }}$. It sets at $7: 44 \mathrm{pm}$ on January $28^{\text {th }}$.

Pluto, north of Sagittarius' teapot, a faint mag 14.2 object in the southeastern predawn sky, rises at 6:10 am on January $28^{\text {th }}$ and at $4: 22$ am on February $25^{\text {th }}$.

Vesta (mag 7.7 in Capricornus) is unobservable and Ceres (mag 9.1 in Sagittarius) becomes observable in the pre-dawn over the course of the month.

## Comets

Ref http://www.aerith.net/comet/weekly/current.html, http://cometchasing.skyhound.com/, http://in-thesky.org/comets.php, https://www.ast.cam.ac.uk/~jds/

Comet 15P/Finlay was discovered in 1886 and returns every 6.5 years. After abruptly going into outburst in December, 2015 it is now an early evening binocular object of around magnitude 8.5 and dimming. On January $28^{\text {th }}$ it sets at $9: 47 \mathrm{pm}$ and on February $25^{\text {th }}$ it sets at 10:45 pm. Over the next month, it moves east through Pisces, climbing higher in the western evening sky.


C/2014 Q2 (Lovejoy) has peaked in brightness but remains conveniently positioned for observing all month. In late January, it should still be visible with unaided eyes from a dark site. It is moving west from Triangulum, past Almaak in Andromeda on February $4^{\text {th }}$ (nearest at approximately 40 arc-minutes), through western Perseus, and into Cassiopeia. On January $28^{\text {th }}$ it sets at 3:20 am and after February $8^{\text {th }}$ it becomes circumpolar.


## Meteor Shower(s)

Ref. http://www.amsmeteors.org/meteor-showers/meteor-shower-calendar/
Nothing to report.

## Asteroids

Ref. http://neo.jpl.nasa.gov/ca/, http://www.minorplanetcenter.net/
According to the Minor Planet Centre...
Near-Earth Objects Discovered This Year: 110 ( $\sim 109 /$ month)
Minor Planets Discovered This Year: 19,777(?) (~6000/month)
Comets Discovered This Year: 3 ( $\sim 1 /$ month)

## Satellites

Current GTA International Space Station morning pass series ends Jan $28^{\text {th }}$ (Most are visible between 5 to 6:30 am ). Evening passes commence on Feb $3^{\text {rd }}$ running until Feb $24^{\text {th }}$ (most between 6:30 and 8:30 pm). Some higher/brighter ones include*:

| Date | Mag. | Time |
| :---: | :---: | :---: |
| 05-Feb | -2.9 | 7:17:23 pm to 7:20:12 pm |
| 06-Feb | -2.2 | 6:25:50 pm to 6:30:41 pm |
| 07-Feb | -3.2 | 7:09:47 pm to 7:13:45 pm |
| 08-Feb | -3.3 | 6:17:48 pm to 6:24:02 pm |
| 09-Feb | -2.2 | 7:02:28 pm to 7:06:55 pm |
| 10-Feb | -2.9 | 6:10:11 pm to 6:16:40 pm |
| 18-Feb | -2.8 | 7:17:03 pm to 7:20:39 pm |
| 19-Feb | -2.2 | 6:24:53 pm to 6:30:47 pm |
| 20-Feb | -3.4 | 7:08:58 pm to 7:13:41 pm |
| 21-Feb | -3.0 | 6:16:44 pm to 6:23:08 pm |
| 22-Feb | -2.3 | 7:00:57 pm to 7:07:11 pm |
| *far fut | dicted | times may shift slightly |


| Direction | Alt. |
| :--- | :--- |
| from SW to S | $49^{\circ}$ |
| from SSW to E | $29^{\circ}$ |
| from WSW to NE | $70^{\circ}$ |
| from SW to ENE | $67^{\circ}$ |
| from W to NNE | $37^{\circ}$ |
| from WSW to NE | $57^{\circ}$ |
| from NW to NE | $43^{\circ}$ |
| from NW to E | $30^{\circ}$ |
| from WNW to ESE | $84^{\circ}$ |
| from NW to ESE | $50^{\circ}$ |
| from WNW to SE | $43^{\circ}$ |

Iridium Flares most frequent evening flares occur between $5: 45 \mathrm{pm}$ and $7: 30 \mathrm{pm}$, with morning flares common from 5:30 to 7 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)

Nothing to report.

## Constellations near the Meridian (Annually in February)

8 pm: Columba, Lepus, Orion, Taurus, Auriga, and Camelopardalis 10 pm: Puppis, Canis Major, Monoceros,Canis Minor, Gemini, and Lynx
12 am: Pyxis, Antlia, Hydra, Sextans, Leo, Cancer, Leo Minor, Lynx, and Ursa Major

## Interesting Targets in the Canis Major, Monoceros, Canis Minor, Hydra Region

 Ref: $h$ ttp://www.dibonsmith.com/mon con.htm, "Objects in the Heavens", Sky Safari app, etc.The stars in the evening southern sky in late February pale next to Orion, Taurus, and Gemini, but there are many interesting objects to look at. The outer reaches of the Milky Way passes through Monoceros, while extra-galactic objects populate Hydra. (Note that the " symbol represents an angular measurement in arcseconds or $1 / 3600$ degree. The 'symbol is $1 / 60$ of a degree. The Moon is $30^{\prime}$ or 1800 " across.)

## Hydra (off galactic plane, lots of galaxies)

Caldwell 59 or NGC3242 or "Ghost of Jupiter" - A magnitude 9.0 planetary nebula T Hya - A pulsating variable star (between mags 6.7-13.5) cycling over 299 days Messier 48 - Large mag 5.8 open cluster (binoculars)

## Canis Minor

Procyon or alpha CMi - Fifth distant star to Sun at 11.5 Light-years away
Gomeisa or beta CMi - An eruptive variable star (mag 2.84-2.92) that is fast rotating (once per day)!

## Monoceros (many nebulae and clusters)

Beta Mon - Triple star system! Visually mag 3.74, but the components are mag 4.5, 5.2, and 5.6
Messier 50 or Heart-shaped Cluster - A nice and compact mag 6.0 open cluster
NGC 2237 or Caldwell 49 or Rosette Nebula - Mag 5.5 nebula surrounding young stars that form NGC 2244
NGC 2264 or Cone Nebula - A mag 3.9 nebula
Canis Major (Milky Way passes through, so lots of open clusters and nebulae)
Sirius - Night's brightest star only 8.6 LY away (4th distant). Brilliant colour flashes due to its low alt, extreme brightness (mag -1.46). Small companion Sirius B "The Pup" is an observing challenge needing larger apertures Canis Majoris Cluster or Caldwell 64 or NGC 2362 - Open Cluster of about 60 stars within about 8' Messier 41 or Little Beehive - A mag 4.5 open cluster with a deeply red star in its core 145 CMa or h3945 or "Winter Albireo" - Double star with deep colours of Bright Citrus orange (mag 5.0) and royal blue (mag 5.9) ( $\operatorname{sep} 26.8^{\prime \prime}$ )

## Lepus

Messier79 - A bright mag 7.7 Globular Cluster
Gamma Lep or $\gamma$ Leporis - Yellow (mag 3.6) and Orange (mag 6.3) double star (sep 96")
Hind's Crimson star or R Leporis - Mira type variable (mag 5.5-10.5) over 427 days, carbon star, very red NGC2017 - Multi-coloured close star grouping (cluster or multiple system) about 5' across

Puppis (Milky Way passes through it, rich in objects)
Zeta Pup or Naos - Blue-white mag 2.2 star, at $42,000^{\circ}$ among the hottest stars known! Rho Pup - delta Scuti type variable, mag range is 2.68 to 3.87 every 3hours, 22 minutes, 52 seconds! Messier 46 or NGC2437 - A mag 6.1 open cluster containing the mag 10 Planetary Nebula NGC2438 Messier 47 or NGC 2422 - A bright mag 4.4 open cluster

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

Questions or comments to chris.vaughan@astrogeo.ca
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