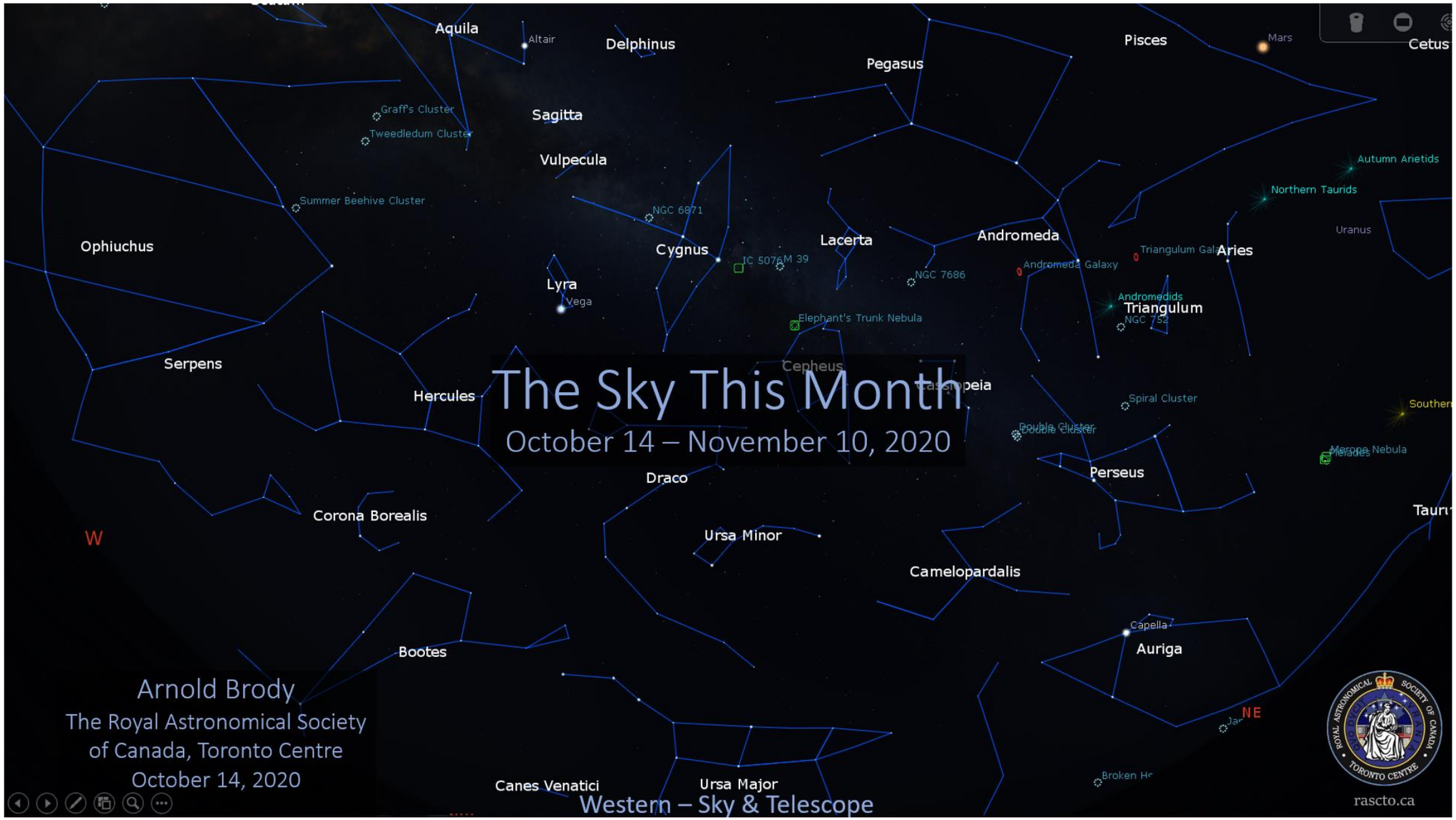

The Sky This Month

October 14 – November 10, 2020

Arnold Brody
The Royal Astronomical Society of Canada, Toronto Centre
October 14, 2020


Mars
Graff's Cluster
Tweedledum Cluster
Summer Beehive Cluster
Mooz (Moose)
NGC 6871
Ajijaak (Crane)
IC 5070
M 39
NGC 7686
Andromeda Galaxy
Triangulum Galaxy
Autumn Arietids
Northern Taurids
Uranus
Andromedids
NGC 752
Elephant's Trunk Nebula
Topics
• Mars missions
• Observing:
• Grand Solar System Tour
• Halloween in space
Spiral Cluster
Double Cluster
Bugona Giizhig (Hole in the Sky)
Noondeshin Bemaadizid (Exhausted Bather)
Madoodiswan (Sweat Lodge)
Maang (Loon)
W
Ojiig (Fisher)
NE
Broken H
Ojibwe
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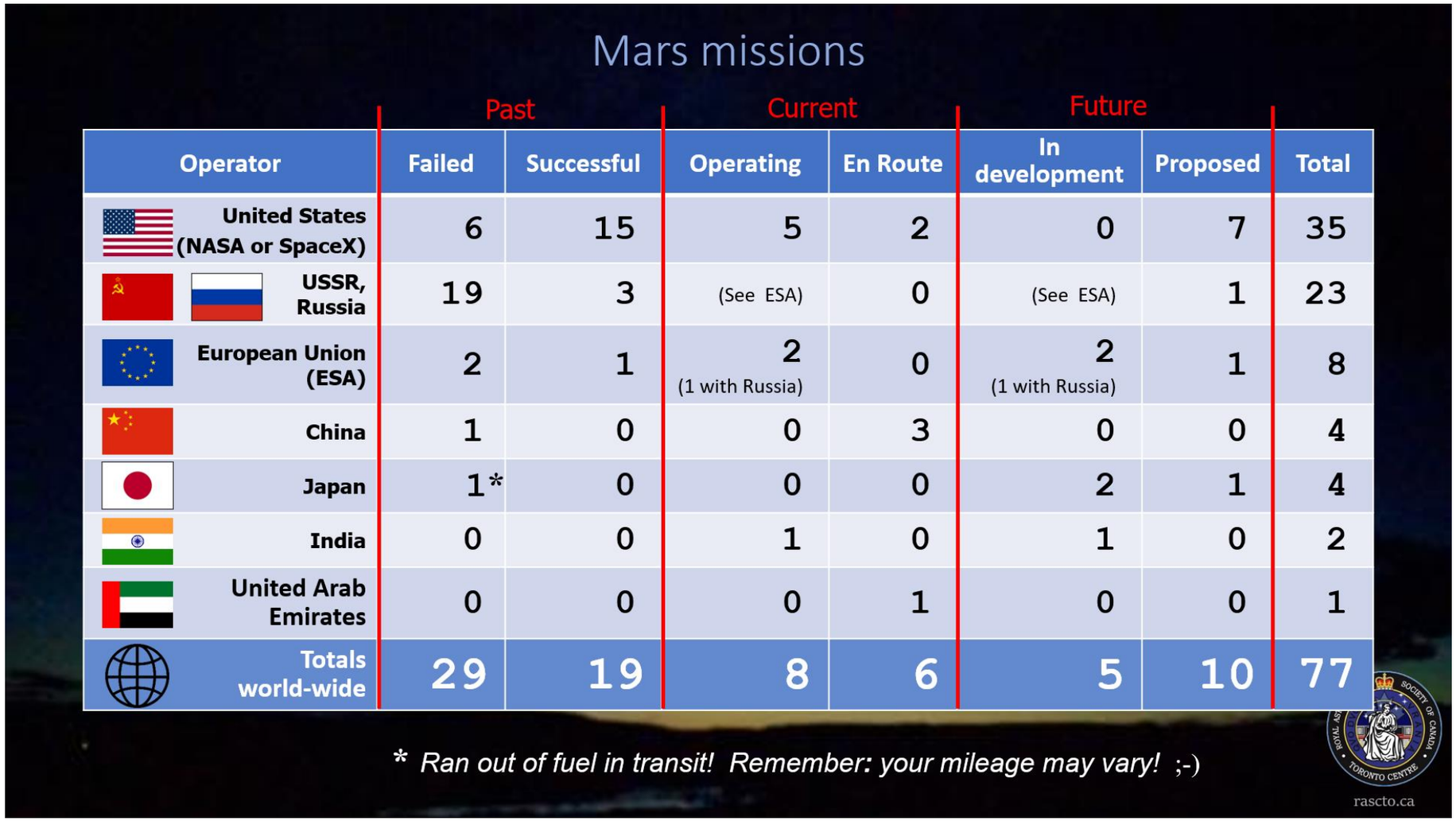
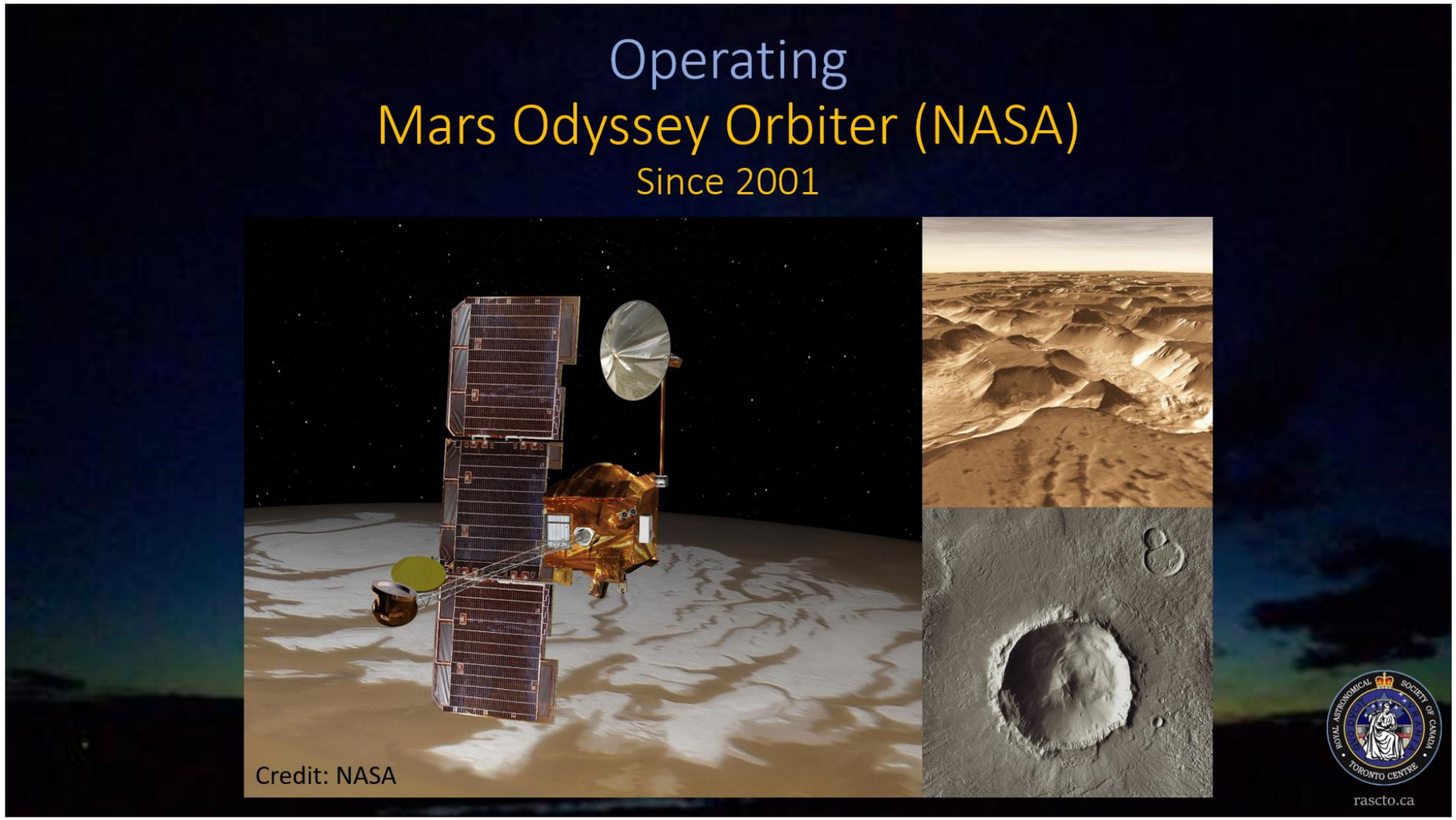


Other than Earth, Mars is by far the planet we Earthlings have studied the most. To date, we have launched 62 missions to Mars with about half, or 53%, either successful, still operating, or on their way.



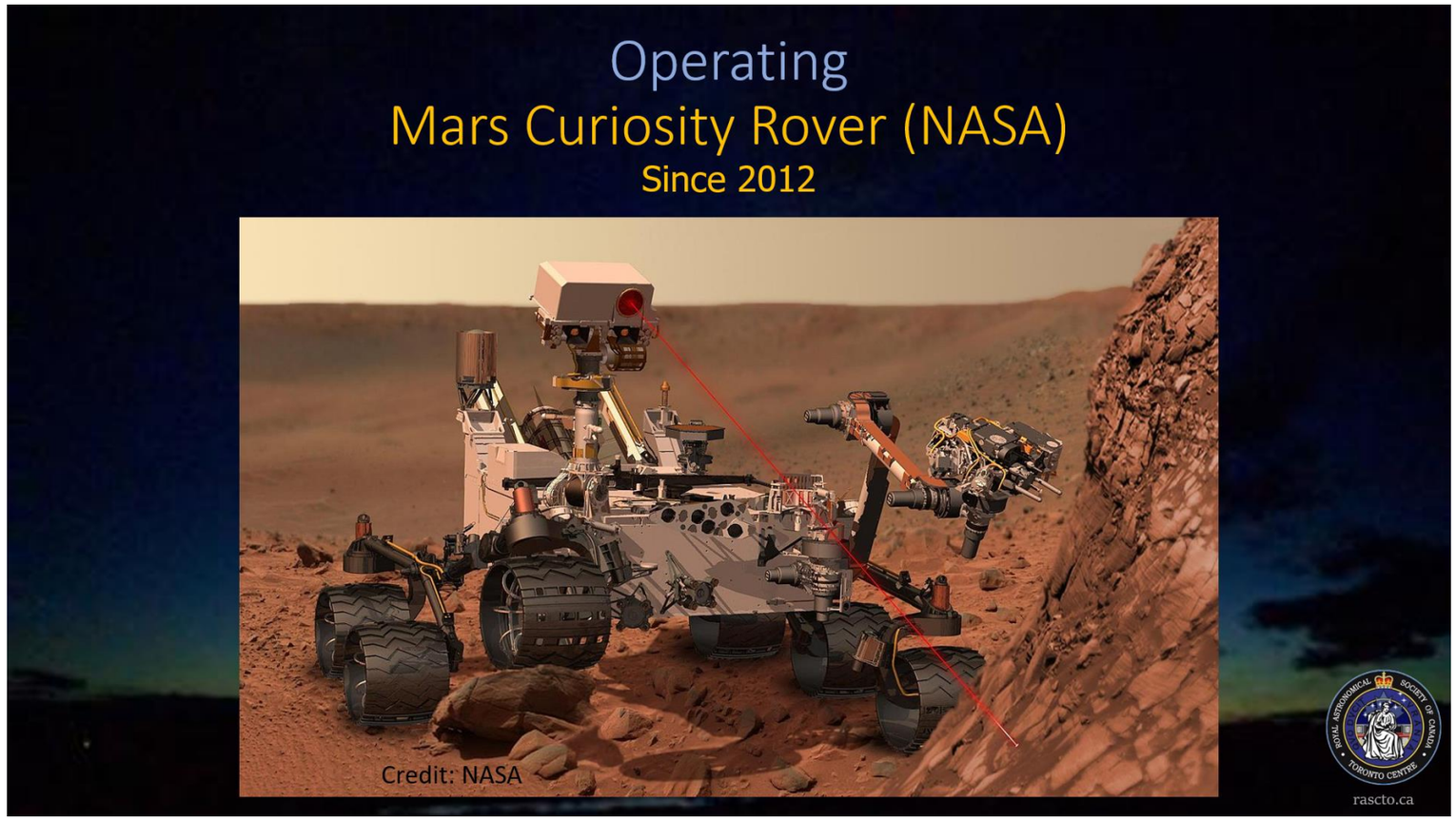
Here’s a quick review the Mars missions still operating.

First is the Mars Odyssey Orbiter that began sending back thermal and spectrographic images since it entered into Martian orbit 21 years ago this month. It is still active, serving as a communication link for the Curiosity rover. Odyssey has enough fuel for another 5 years.

Mars Express performs high-resolution imaging and mineralogical mapping of the surface, radar sounding of the subsurface structure down to the permafrost, precise determination of the atmospheric circulation and composition, and studies the interaction of the atmosphere with the interplanetary medium. It has enough fuel to operate until 2026.

For the last 14 years, MRO has been sending back data on the geology and climate of Mars, searching for future landing sites, and relaying data from surface missions back to Earth.

NASA intends to continue the mission at least through the late 2020s.



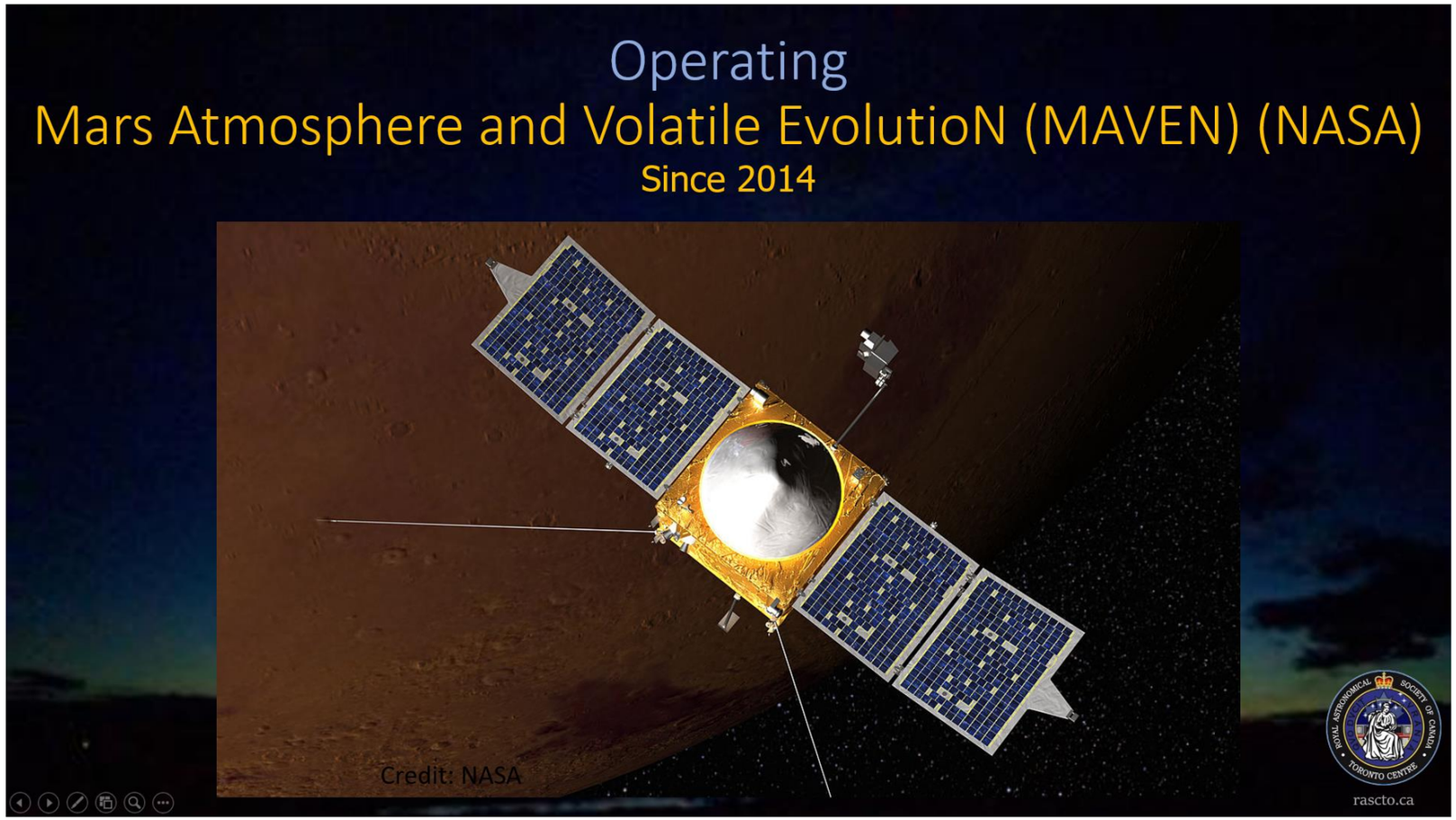
The highly successful Curiosity rover is packed with 12 scientific instruments – including a laser to zap rocks for spectrographic analysis and a drill for extracting rock powder for analysis inside onboard labs. The rover is investigating the Martian climate and geology and helping us assess whether the site inside Gale Crater ever offered conditions favorable for microbial life.

In December 2012, the rover's 2-year mission was extended indefinitely. Its plutonium power supply can probably last for another 12 + years.

India’s Mars Orbiter Mission, or MOM, is a demonstration project to develop the technologies for designing, planning, managing, and operating an interplanetary mission.

MOM carries five scientific instruments for studying the morphology, topography and mineralogy of the Mars surface, and the constituents and dynamics of the Mars atmosphere.

It currently has 13 kg of fuel left from the 40 kg it had after orbital insertion in 2014.



MAVEN was developed by NASA to investigate the upper atmosphere and ionosphere of Mars and how the solar wind strips volatile compounds from this atmosphere. This research gives insight into how the planet's climate has changed over time.

MAVEN's initial mission of 1 year has been repeatedly extended, and its orbit made less elliptical so it can serve as a relay for rover missions. It has enough fuel to last until 2030 or longer.

A key goal of TGO is to gain a better understanding of methane (CH_4) and other trace gases present in the Martian atmosphere that could be evidence for possible biological activity.

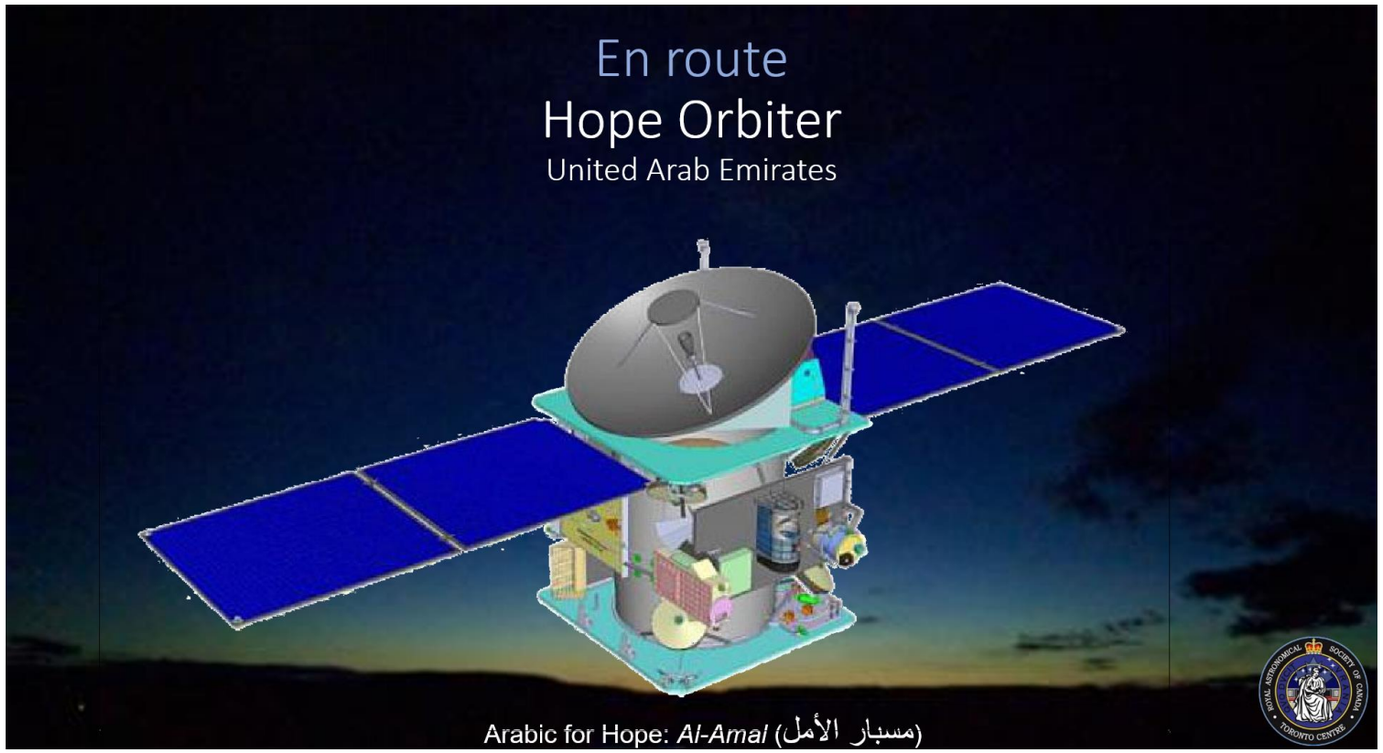
A lander called Schiaparelli was deployed from TGO 3 days before entering Mars orbit, but it crashed-landed at 540 km/h.

Like other orbiters, TGO will also operate as a communication link to Earth for Mars landers and rovers.

TGO has a planned 7-year mission.

Insight is a robotic lander designed to study the deep interior of Mars. It was manufactured by Lockheed Martin and is managed by NASA's JPL. Most of its scientific instruments were built by European agencies.

InSight is studying the size, thickness, density and overall structure of Mars' core, mantle and crust, as well as the rate at which heat escapes from the planet's interior. It has a seismic sensor that can interpret the stratification of the core, mantle and crust through any Mars-shaking activity including meteor hits and air-bursts. It has drilled 5 meters into the crust to measure heat coming from Mars' interior and reveal the planet's thermal history. Its initial mission is 24 months long, which has 1 month to go. It is powered by two circular solar arrays.



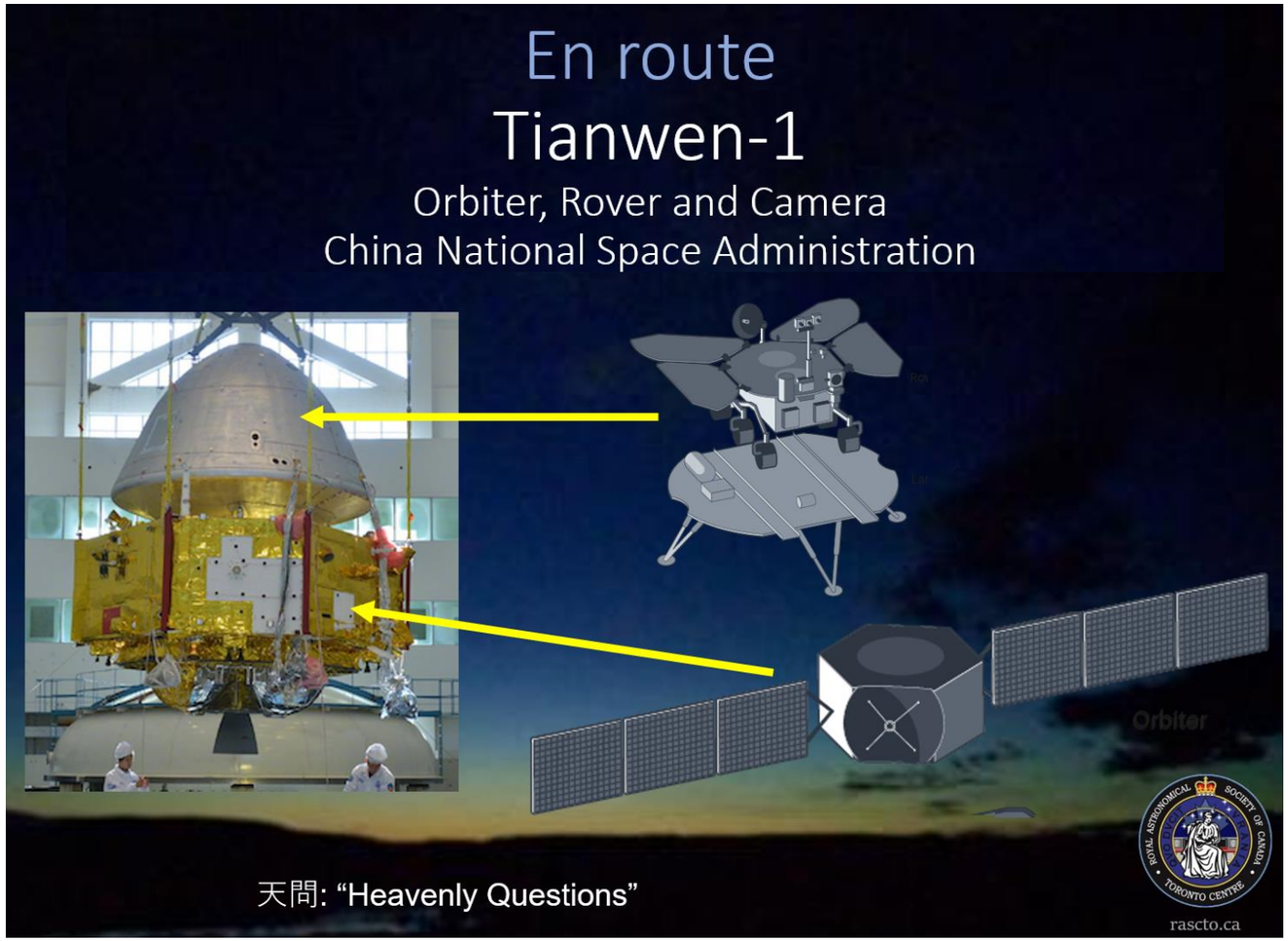
Here's what's en route to Mars…

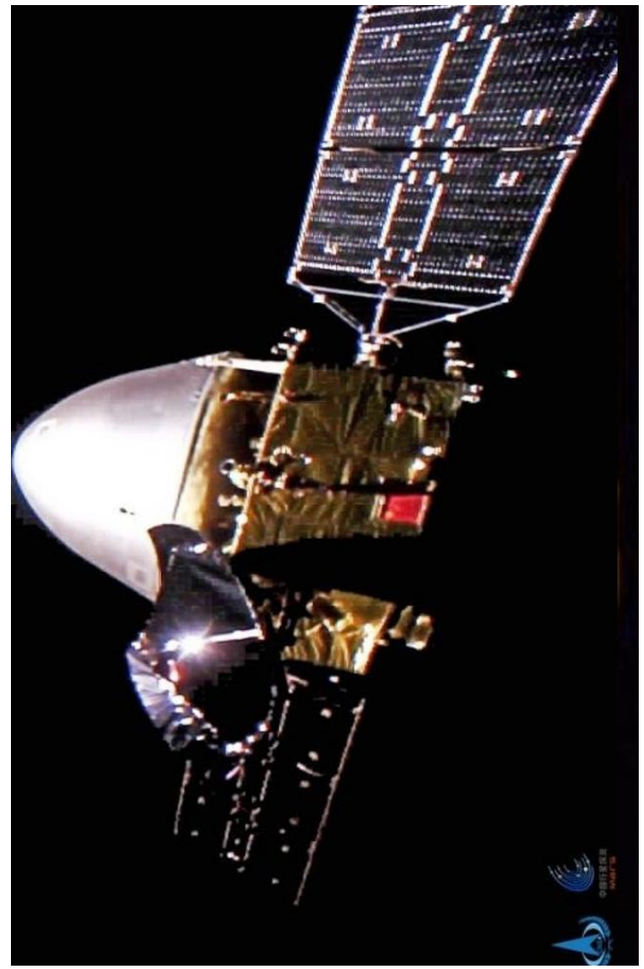
HOPE is an orbiter from the United Arab Emirates, their first interplanetary mission with international support.

The name Hope was chosen as a wish for the future of the region as it transitions from a petroleum-based economy to one focused on technology and the information-age.

The orbiter was constructed at the University of Colorado Bolder with UAE scientists and engineers working with the university's Laboratory for Atmospheric and Space Physics. The University of Arizona and University of California Berkeley also helped. A Ukrainian Transport plane ferried the completed spacecraft from Colorado to Dubai for testing and then to Japan for launch atop a Mitsubishi Heavy Industries rocket.

Scientifically, the probe will study the lower atmosphere of Mars to fill in gaps from the MAVEN mission and help paint a complete picture of Mars's atmosphere escape into space.





China is sending an orbiter and a rover combined in their Tianwen-1 mission. Between them, they intend to look for evidence of current or past life, produce Martian surface maps, characterize Martian soil composition and water ice distribution, as well as examine the Martian atmosphere and ionosphere.

Partway on its journey to Mars, the spacecraft deployed a third component: a selfie-camera to take pictures of the spacecraft, then transfer the images to craft by wifi for beaming back to Earth. Here’s one of its pictures on the right.

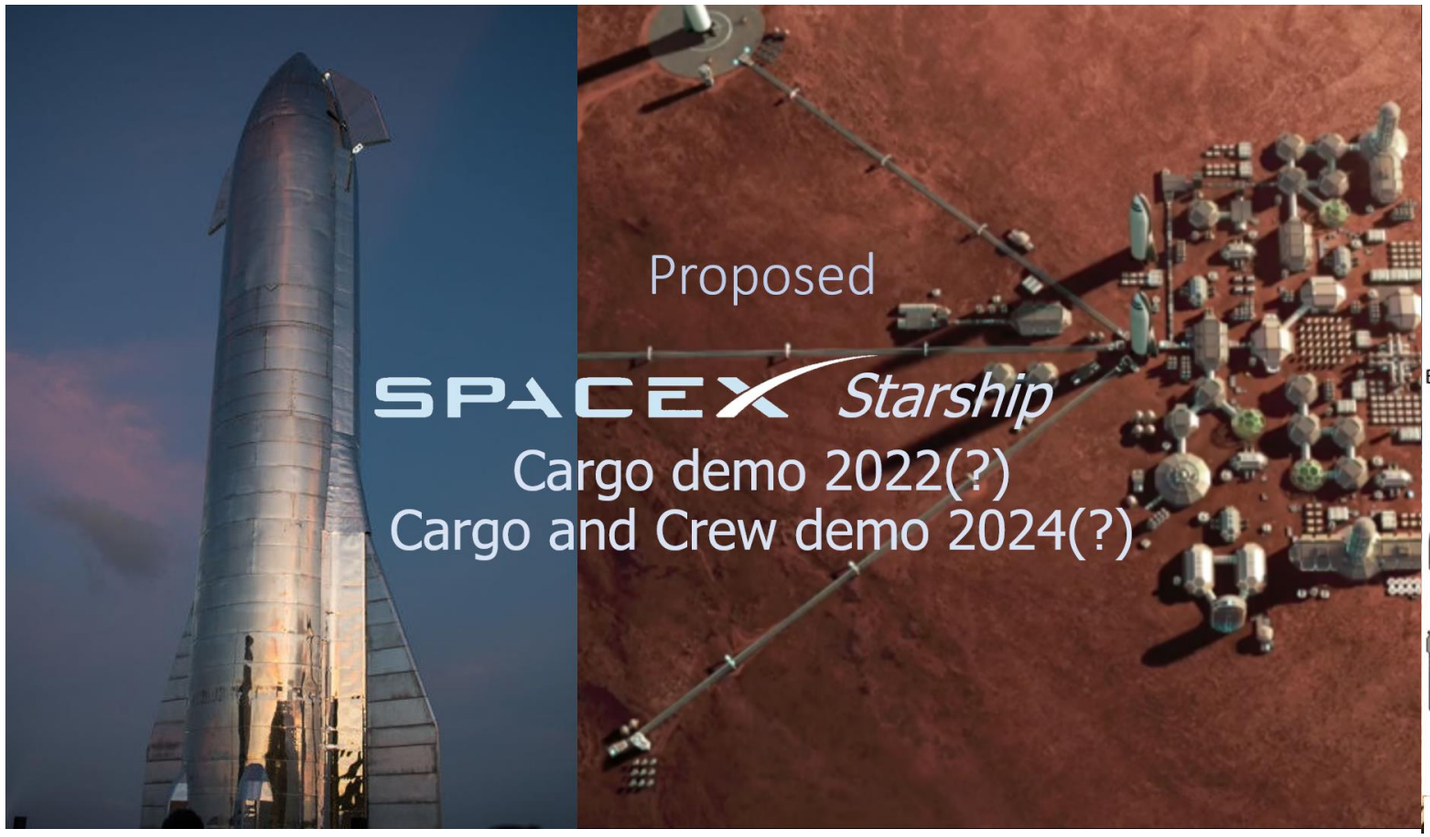
Tianwen-1 has international support. Argentina is helping track the spacecraft, France helped with the Rover’s laser spectroscopy system, and Australia contributed to the Orbiter’s magnetic mapping system and helped calibrate the flight instruments.

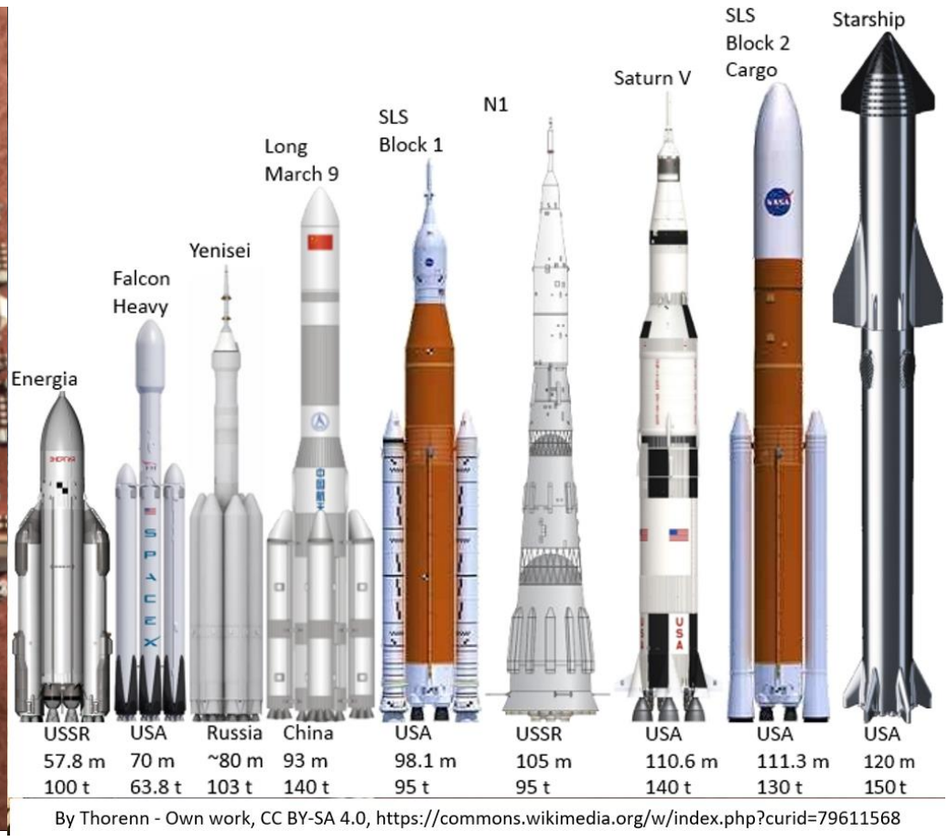
NASA’s Perseverance rover carries seven scientific instruments to study the Martian surface at Jezero crater. It will analyze surface materials, use ground penetrating radar, measure wind speed, direction, pressure and temperature, test extraction of oxygen from CO2 for rocket fuel or life support, and detect organic compounds with fine scale imaging and ultraviolet lasers.

Perseverance will also cache samples for pickup and return to Earth by a future mission.

The rover’s plutonium power system offers a 14-year operational lifetime.

The Ingenuity helicopter is a demonstration project to see if a small helicopter can help a rover by scouting for suitable targets and choosing a path for navigating to them. It carries a downward-facing hi def camera and is expected to fly up to 90 seconds before needing a recharge.





As for future mars missions, back in 2016 Elon Musk said SpaceX would attempt a cargo-to-Mars demo in 2022 with a cargo-and-crew to Mars demo 2 years after that. The vehicle for getting there would be Starship, currently under development at a SpaceX facility in Boca Chica, Texas.

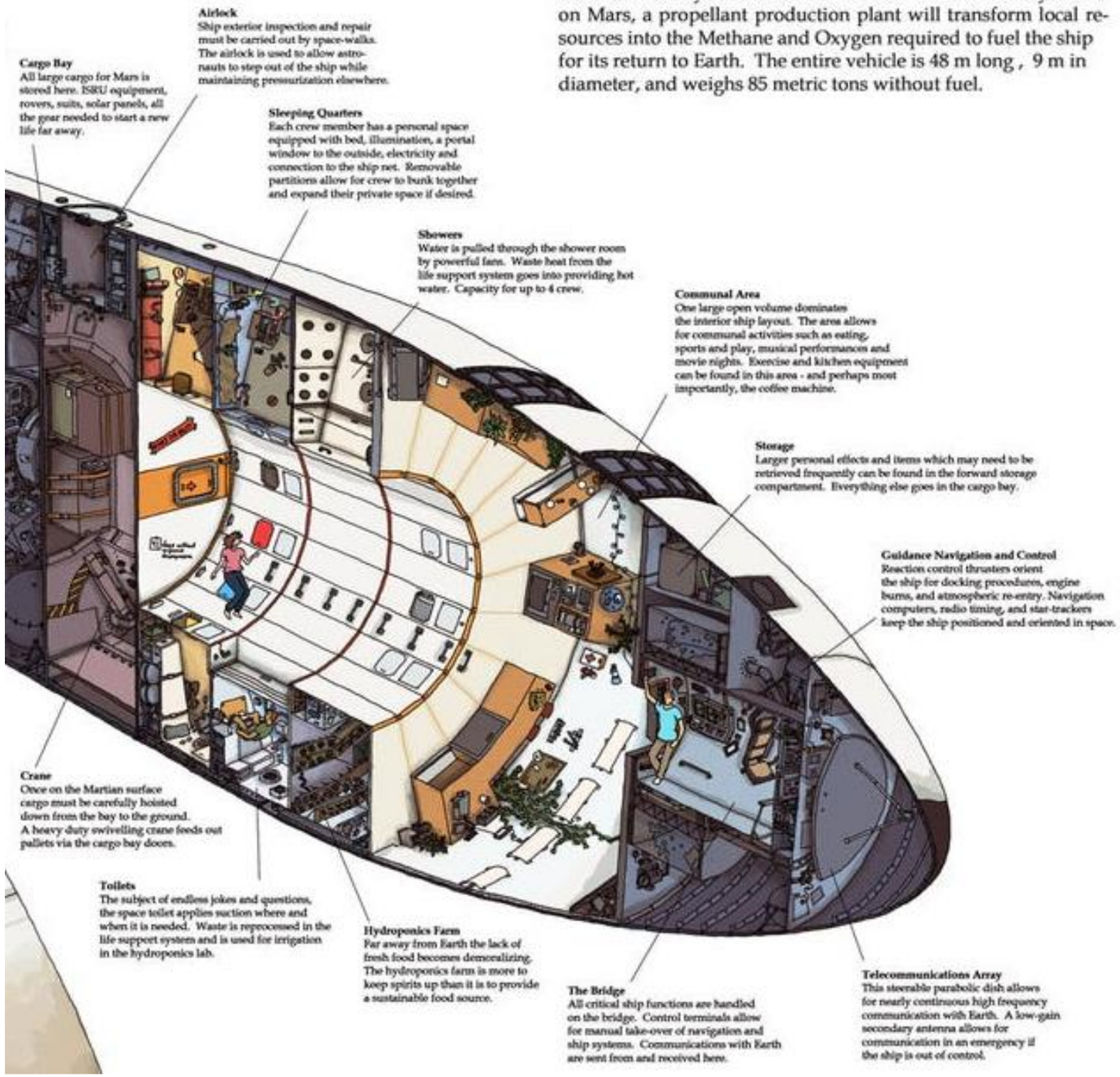
Development of Starship is progressing in fits and starts, so it remains to be seen if SpaceX can actually send a Starship to Mars in just two years. The first prototype of the spaceship is seen on the left.

With the spacecraft stacked on top of the booster stage, Starship will stand 120 meters tall, the world's biggest rocket to date. Construction has begun on the first booster stage.

Starship will have a payload volume bigger than the James Web telescope, and will be designed for in-space refueling from a Starship refueling craft for interplanetary travel.

[SpaceX]

Starship is the first ever crewed Mars lander to actually begin testing and construction. The vehicle is eventually intended to ferry dozens of crew to Mars simultaneously. Once on Mars, a propellant production plant will transform local resources into the Methane and Oxygen required to fuel the ship for its return to Earth. The entire vehicle is 48 m long , 9 m in diameter, and weighs 85 metric tons without fuel.



Airlock
Ship exterior inspection and repair must be carried out by space-walks. The airlock is used to allow astronauts to step out of the ship while maintaining pressurization elsewhere.

Cargo Bay
All large cargo for Mars is stored here. ISRU equipment, rovers, suits, solar panels, all the gear needed to start a new life far away.

Sleeping Quarters
Each crew member has a personal space equipped with bed, illumination, a portal window to the outside, electricity and connection to the ship net. Removable partitions allow for crew to bunk together and expand their private space if desired.

Showers
Water is pulled through the shower room by powerful fans. Waste heat from the life support system goes into providing hot water. Capacity for up to 4 crew.

Communal Area
One large open volume dominates the interior ship layout. The area allows for communal activities such as eating, sports and play, musical performances and movie nights. Exercise and kitchen equipment can be found in this area - and perhaps most importantly, the coffee machine.

Storage
Larger personal effects and items which may need to be retrieved frequently can be found in the forward storage compartment. Everything else goes in the cargo bay.

Guidance Navigation and Control
Reaction control thrusters orient the ship for docking procedures, engine burns, and atmospheric re-entry. Navigation computers, radio timing, and star-trackers keep the ship positioned and oriented in space.

Crane
Once on the Martian surface cargo must be carefully hoisted down from the bay to the ground. A heavy-duty swivelling crane feeds out pallets via the cargo bay doors.

Toilets
The subject of endless jokes and questions, the space toilet applies suction where and when it is needed. Waste is reprocessed in the life support system and is used for irrigation in the hydroponics lab.

Hydroponics Farm
Far away from Earth the lack of fresh food becomes demoralizing. The hydroponics farm is more to keep spirits up than it is to provide a sustainable food source.

The Bridge
All critical ship functions are handled on the bridge. Control terminals allow for manual take-over of navigation and ship systems. Communications with Earth are sent from and received here.

Telecommunications Array
This steerable parabolic dish allows for nearly continuous high frequency communication with Earth. A low-gain secondary antenna allows for communication in an emergency if the ship is out of control.

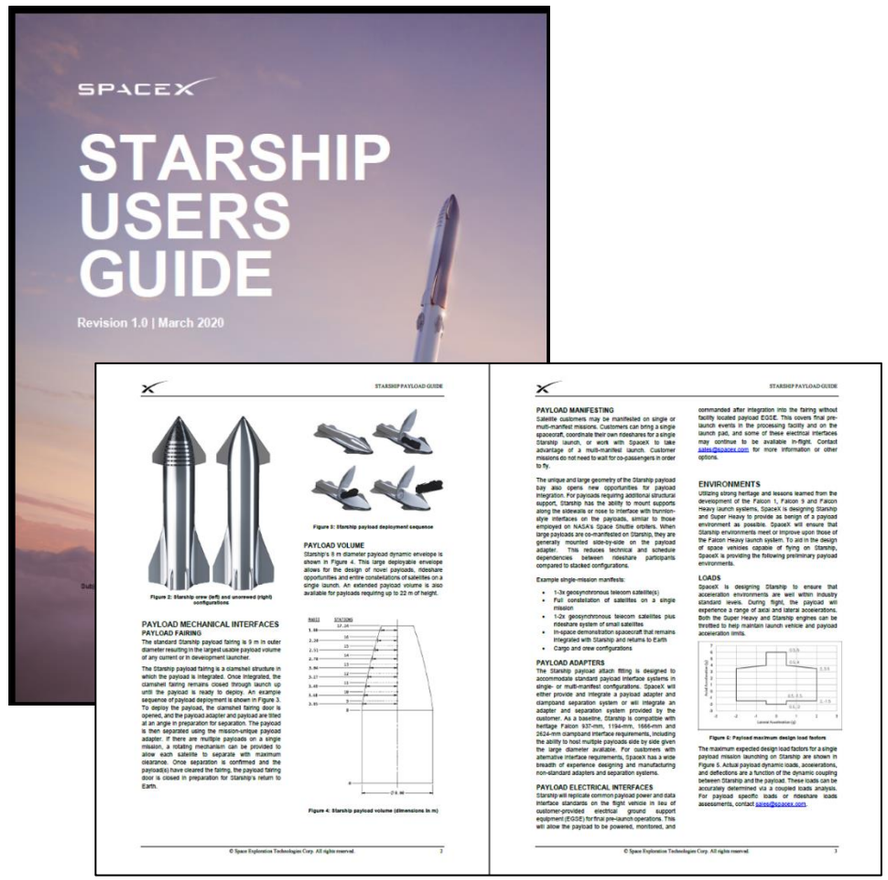
In crew configuration, Starship have capacity for 100 people.

In cargo configuration, it will be able to lift 150 metric tonnes into low earth orbit, 10 metric tonnes more than the most powerful rockets to date.

Because the entire Starship booster and craft will be reusable, the cost of a launch will drop to just $2 million compared to $450M for a Shuttle 10 years ago.

The facility in Texas will ultimately churn out a new Starship every 72 hours, with a planned operational fleet of 1,000.

Interested in going or sending cargo to Mars? Download the Starship User Guide today!



ISS Expedition 64

3 arrived by Soyuz this morning

Launched Oct. 14, 01:45 EDT
Docked at 04:48 EDT

- Sergey Ryzhikov, RSA
- Kathleen Rubins, NASA
- Sergey Kud-Sverchkov, RSA

4 coming up in a Dragon

Launch Oct. 31, 02:40 EDT

- Michael S. Hopkins, NASA
- Victor J. Glover, NASA
- Soichi Noguchi, JAXA
- Shannon Walker, NASA

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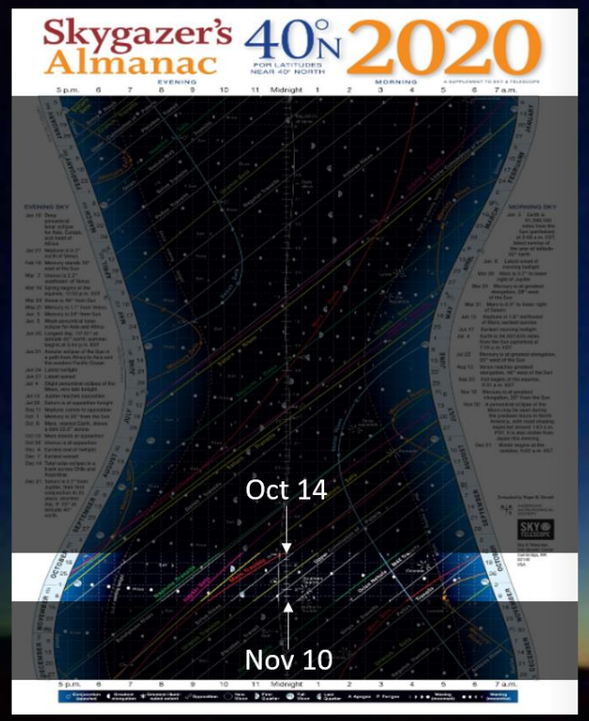
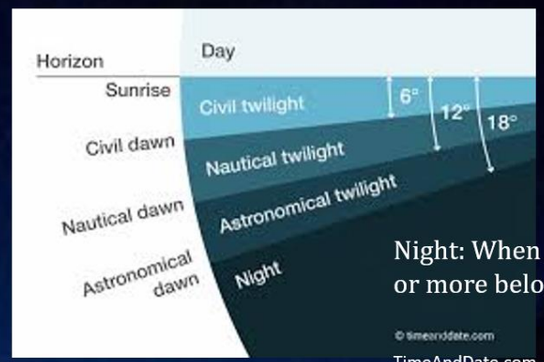
Observing

Generous Night Window



2020 Skygazer's Almanac by Sky & Telescope



Night: When the Sun is 18° or more below the horizon

TimeAndDate.com

Date	Night Begins	Night Ends	Duration
Oct 14	20:08 EDT	05:55 EDT	9 hr. 42 min.
Nov 10	18:33 EST	05:26 EST	10 hr. 53 min.

Visual astronomers have an additional 66 minutes of observing time by including Astronomical twilight/dawn.

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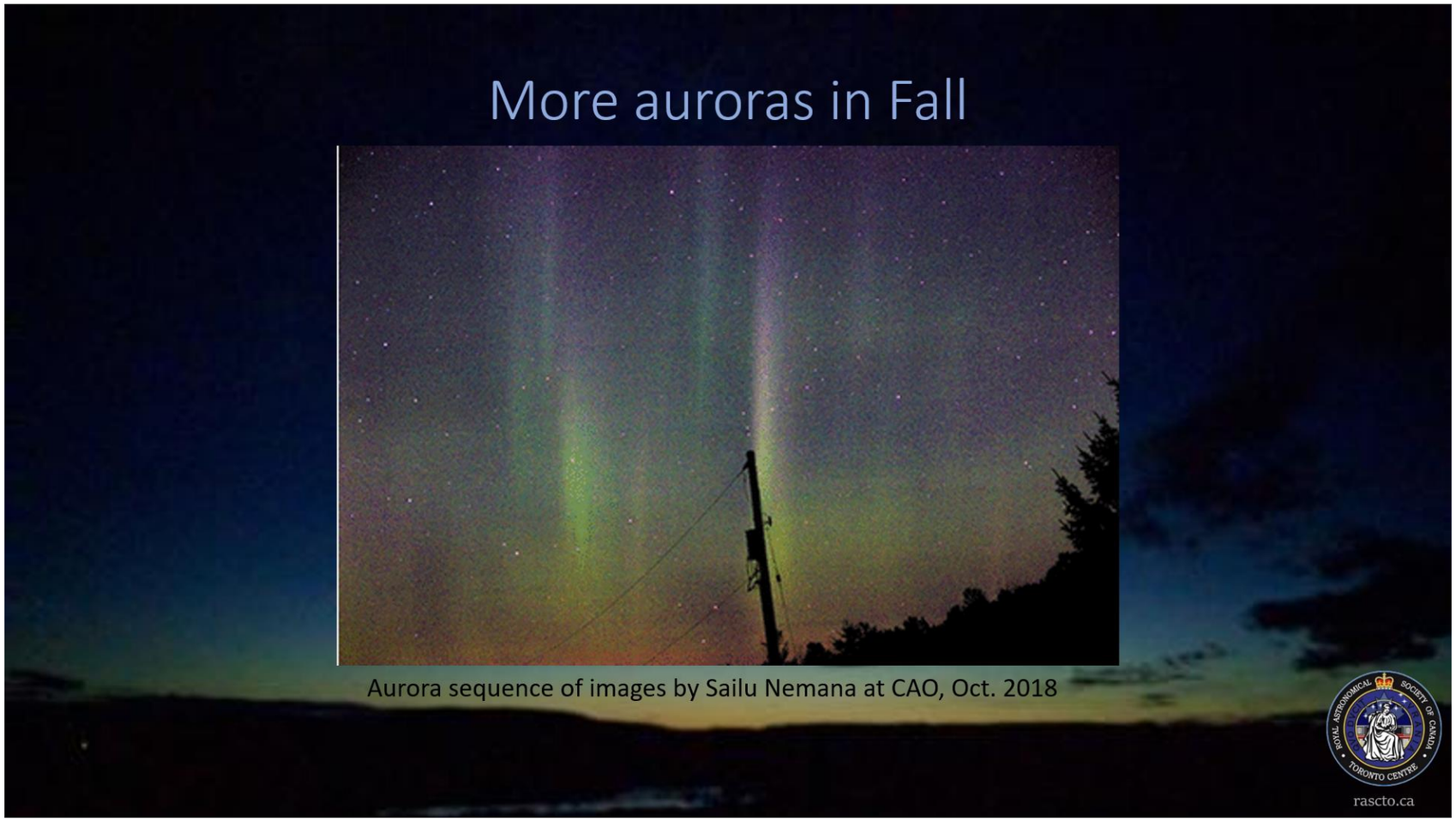
For us in southern Ontario, the sky is as dark as it can be for 9 and three-quarter hours tonight, and nearly 11 hours long by this time next month.

Daylight Savings Time ends at 2 am, Sunday November 1.

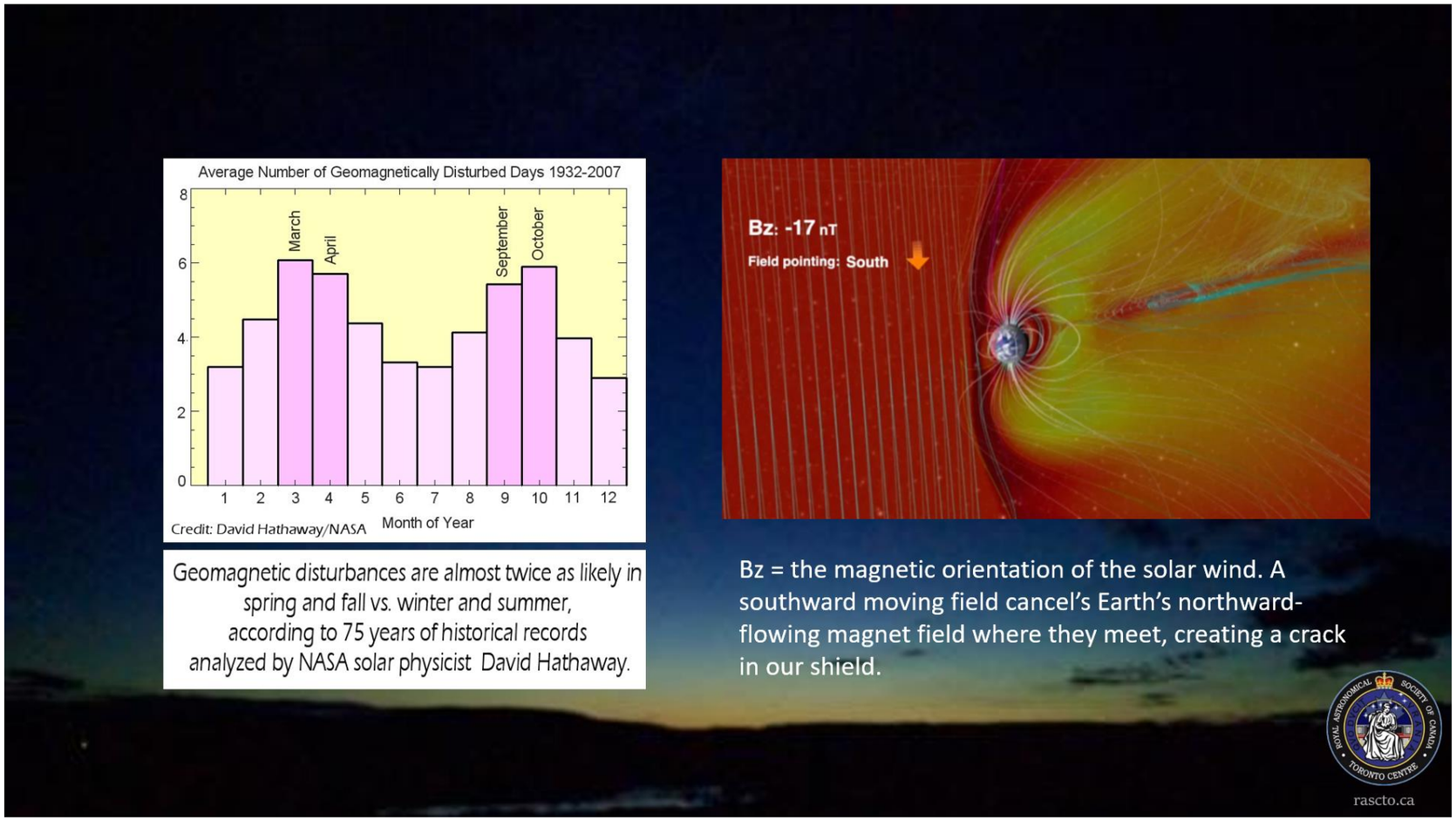
Above are the times of sunset in southern Ontario on Nov 1 and 2.

In the Ontario legislature, Bill 214, the “Time Amendment Act, 2020” received second reading. It calls for end of changing clocks twice a year, staying with daylight savings all year. It can only take effect with similar action in Quebec and the state of New York.

Other locales are debating twice-annual clock changes that studies show lead to increased depression rates, heart attacks, strokes and high numbers of fatal collisions. An extra hour of daylight in winter is expected to lead to more economic activity like shopping after school or work, and be less depressing than sunsets at 4:30 in the afternoon.

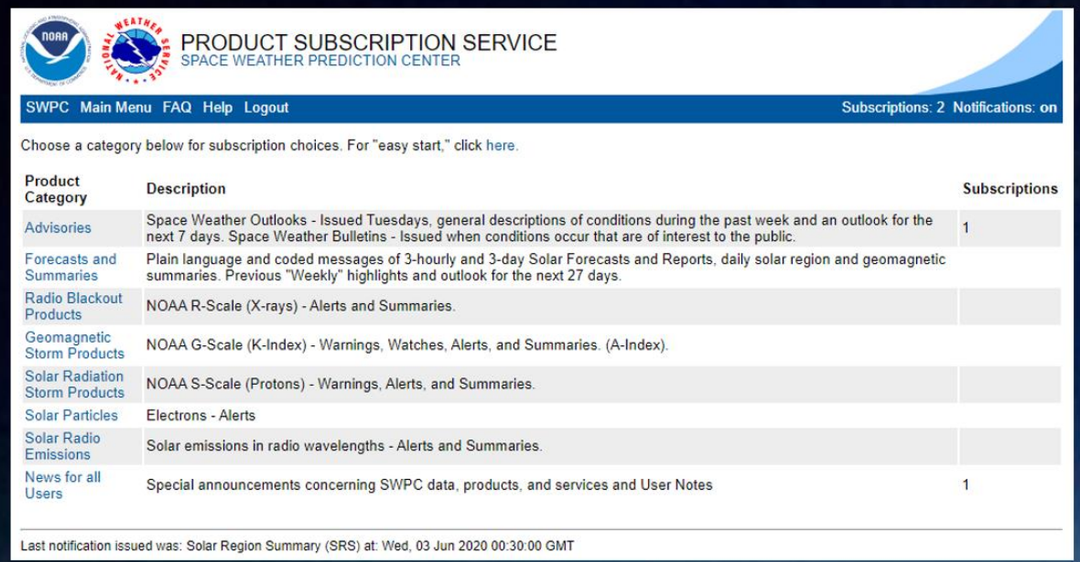


Years of research shows there is an increase in aurora activity when the Earth's magnetic poles lie perpendicular to the solar wind, producing what's called Equinox Cracks through which the solar wind can pour through for hours and excite the upper atmosphere.



The cracks are the result of the "Russell-McPherron effect," named after the researchers who first explained it. South-pointing magnetic fields inside the solar wind cancels Earth's north-pointing magnetic field where they touch, opening a crack through which the solar wind can penetrate. This happens with greatest effect around the equinoxes. A study of historical data shows that September and October are two of the most geo-magnetically active months as a direct result of "equinox cracks."

Sign-up for Aurora Alerts (or more)



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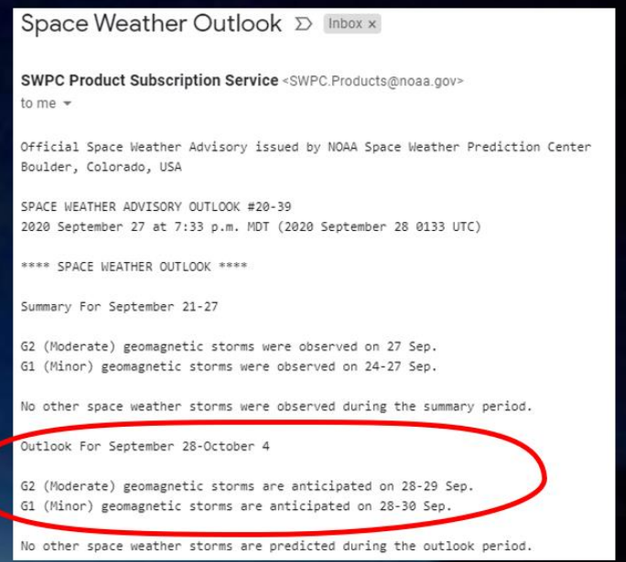
Forecasts and Summaries	Plain language and coded messages of 3-hourly and 3-day Solar Forecasts and Reports, daily solar region and geomagnetic summaries. Previous "Weekly" highlights and outlook for the next 27 days.	
Radio Blackout Products	NOAA R-Scale (X-rays) - Alerts and Summaries.	
Geomagnetic Storm Products	NOAA G-Scale (K-Index) - Warnings, Watches, Alerts, and Summaries. (A-Index).	
Solar Radiation Storm Products	NOAA S-Scale (Protons) - Warnings, Alerts, and Summaries.	
Solar Particles	Electrons - Alerts	
Solar Radio Emissions	Solar emissions in radio wavelengths - Alerts and Summaries.	
News for all Users	Special announcements concerning SWPC data, products, and services and User Notes	1

Last notification issued was: Solar Region Summary (SRS) at: Wed, 03 Jun 2020 00:30:00 GMT

https://pss.swpc.noaa.gov/SubscriptionCategoriesWebForm.aspx



Space Weather Outlook — Inbox ×

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Official Space Weather Advisory issued by NOAA Space Weather Prediction Center
Boulder, Colorado, USA

SPACE WEATHER ADVISORY OUTLOOK #20-39
2020 September 27 at 7:33 p.m. MDT (2020 September 28 0133 UTC)

**** SPACE WEATHER OUTLOOK ****

Summary For September 21-27

G2 (Moderate) geomagnetic storms were observed on 27 Sep.
G1 (Minor) geomagnetic storms were observed on 24-27 Sep.

No other space weather storms were observed during the summary period.

Outlook For September 28-October 4

G2 (Moderate) geomagnetic storms are anticipated on 28-29 Sep.
G1 (Minor) geomagnetic storms are anticipated on 28-30 Sep.

No other space weather storms are predicted during the outlook period.
```

Example of advisory

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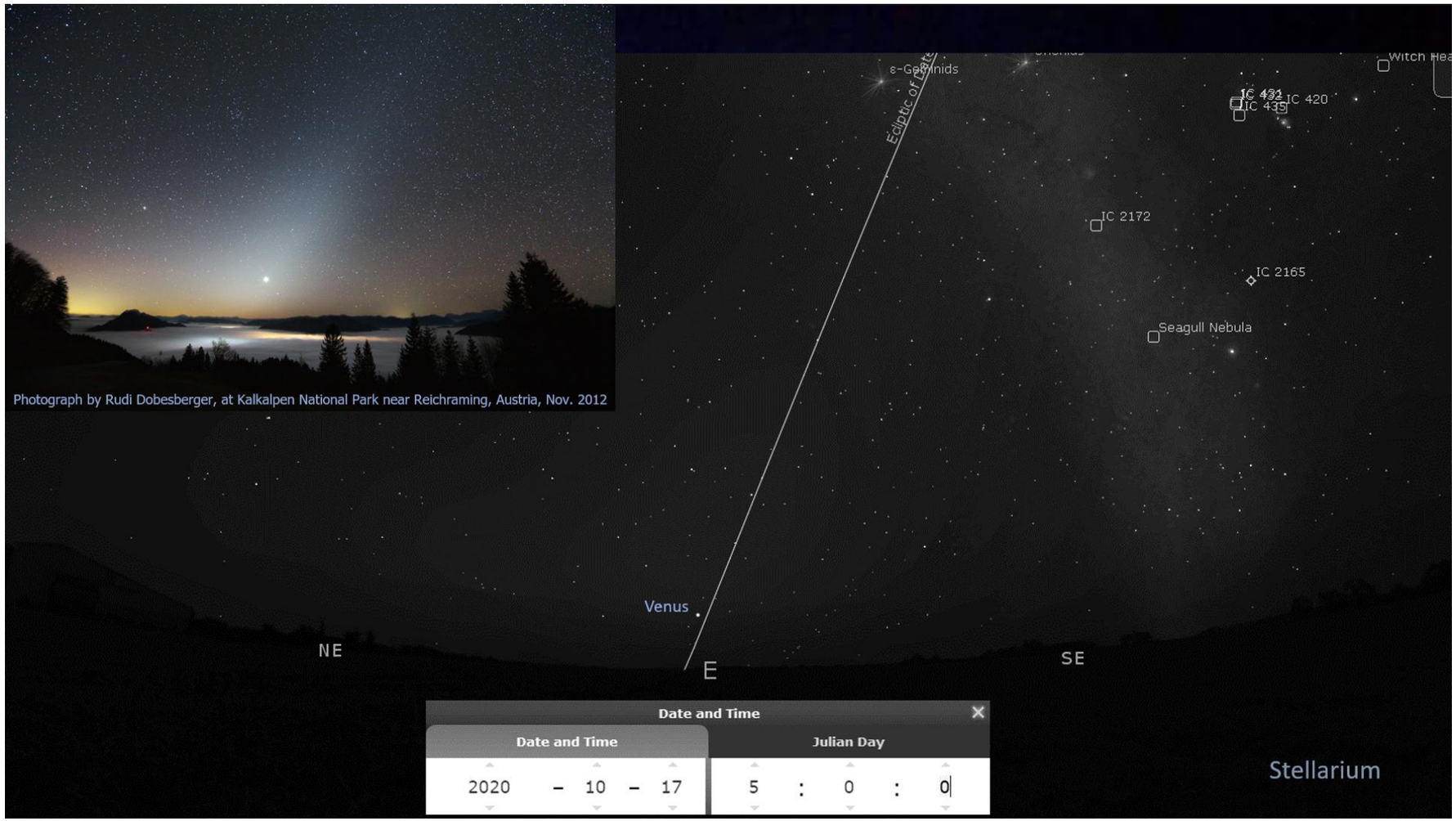
If you'd like to receive aurora alerts in your inbox, visit the NOAA subscription service page and register for the alerts you want.

I'm registered for Advisories which comes every Tuesday, or any day if something significant occurs. An example of an advisory email is on the right.



Another solar effect is the Zodiacal light, as depicted here by Stellarium for this coming Friday morning with the Moon out of the way. The light is most visible when the Ecliptic stands fairly vertical, which it is in the west after sunset in the Spring, or, like now in Autumn, in the east before dawn. The triangular glow is sunlight reflecting off dust lying along the plane of the Solar System, mostly debris from comets.

In the upper left is a photograph of the Zodiacal Light from 2012, when Venus was in a similar position.

Moon Phases

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			Oct 14 Waning Crescent 	**15**	**16** New Moon Perigee	**17**
18	**19**	**20** Orionids peak Moonset 00:33	**21**	**22** Moon, Jupiter, Saturn triangle	**23** First Quarter 	**24**
25	**26**	**27**	**28**	**29** Moon 3° from Mars	**30** Apogee	**31** Full Moon 
Nov 1	**2**	**3**	**4**	**5**	**6**	**7**
8 Last Quarter 	**9**	**10**				

Western:
Hunter's Moon

Ojibwe:
Falling Leaves Moon

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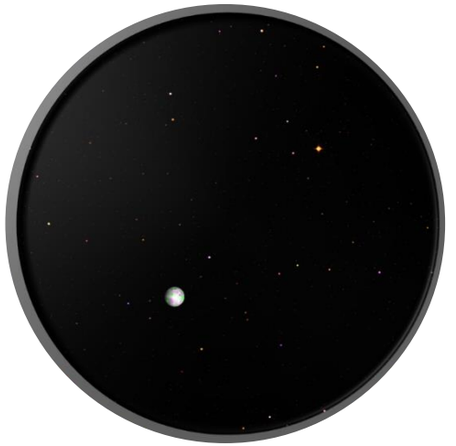
ON TO THE MOON…

We're in the dark stretch of October right now with New Moon just two days from today. It's actually a *Super* NEW Moon, occurring at perigee. It should produce strong tides.

Next week, the Moon sets after midnight Tuesday night into Wednesday, so it won't interfere with the Orionids, peaking that night.

◀ At nightfall on October 22nd, the Moon makes a tight triangle with Jupiter and Saturn…

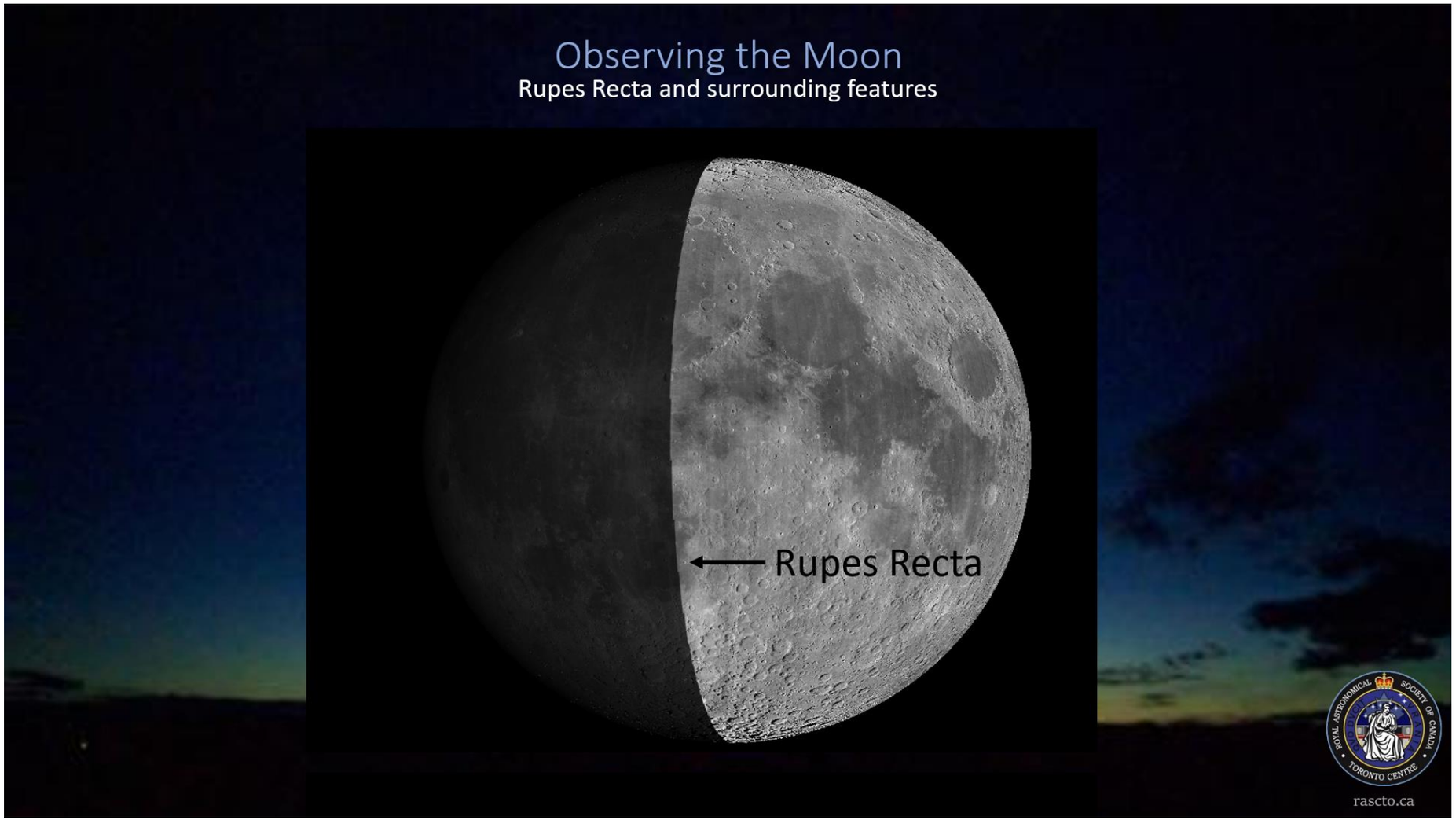
…and comes close to Mars the following Thursday, Oct. 27.▶



The Falling Leaves or Hunter's Moon is on Halloween night, Saturday, Oct. 31. It is just after apogee and will be the smallest MICRO MOON of the year.

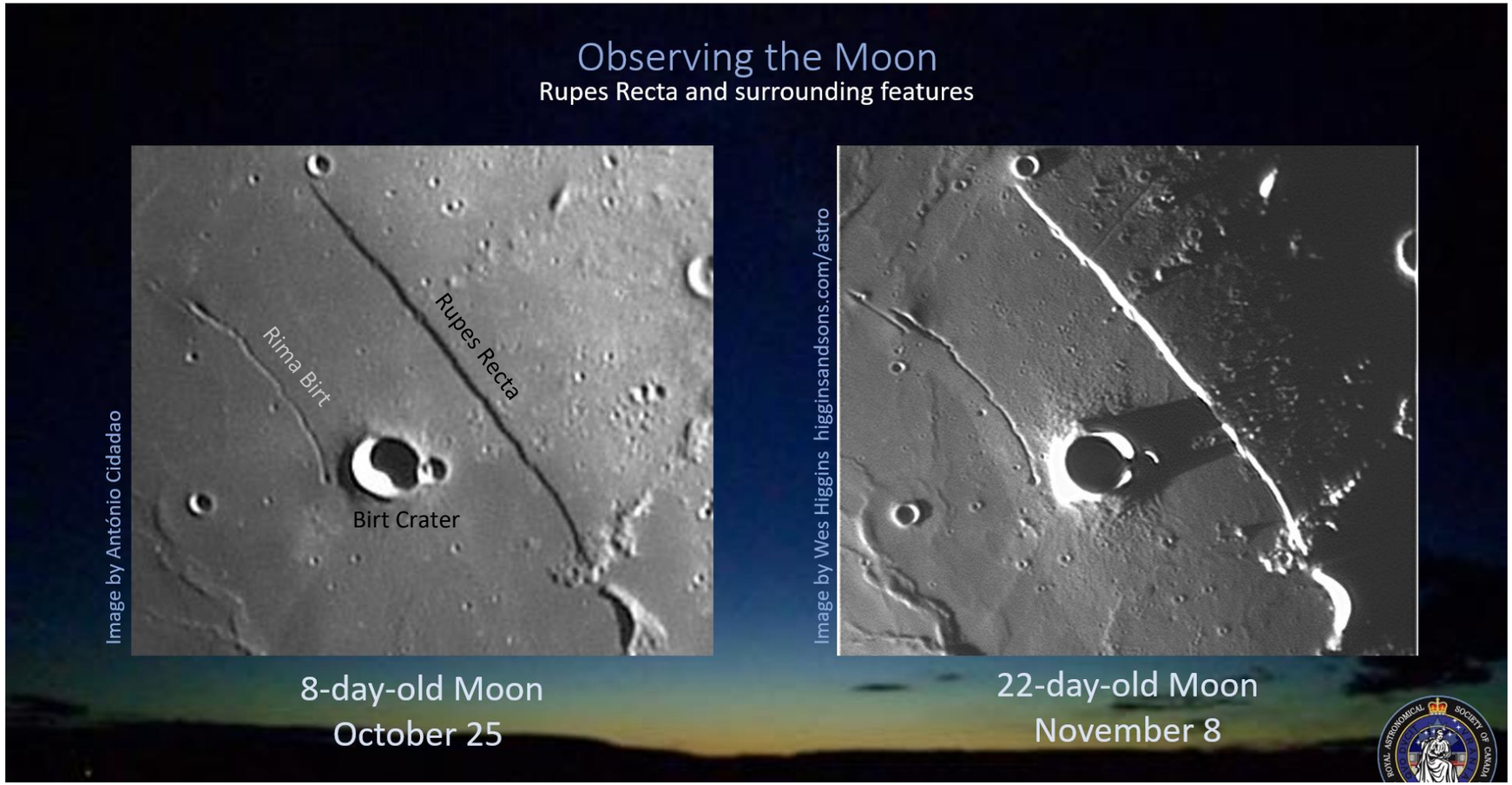
It is also the second full moon of the month. Does that make it a "Blue Moon"? That depends on which definition you use. If you follow the older definition of a Blue Moon being the 3rd Full Moon in a season with 4, then the Full Moon in November will be the "Blue" one. That definition has been misinterpreted or reinterpreted – take your pick – to be the second full moon in a month, in which case, the moon on Oct 31 is a blue moon. No big deal, it's just a name.

Darker nights return the 2nd week of November.



When the Moon is one day past first quarter, there is an opportunity to see Rupes Recta, commonly called the Straight Wall.

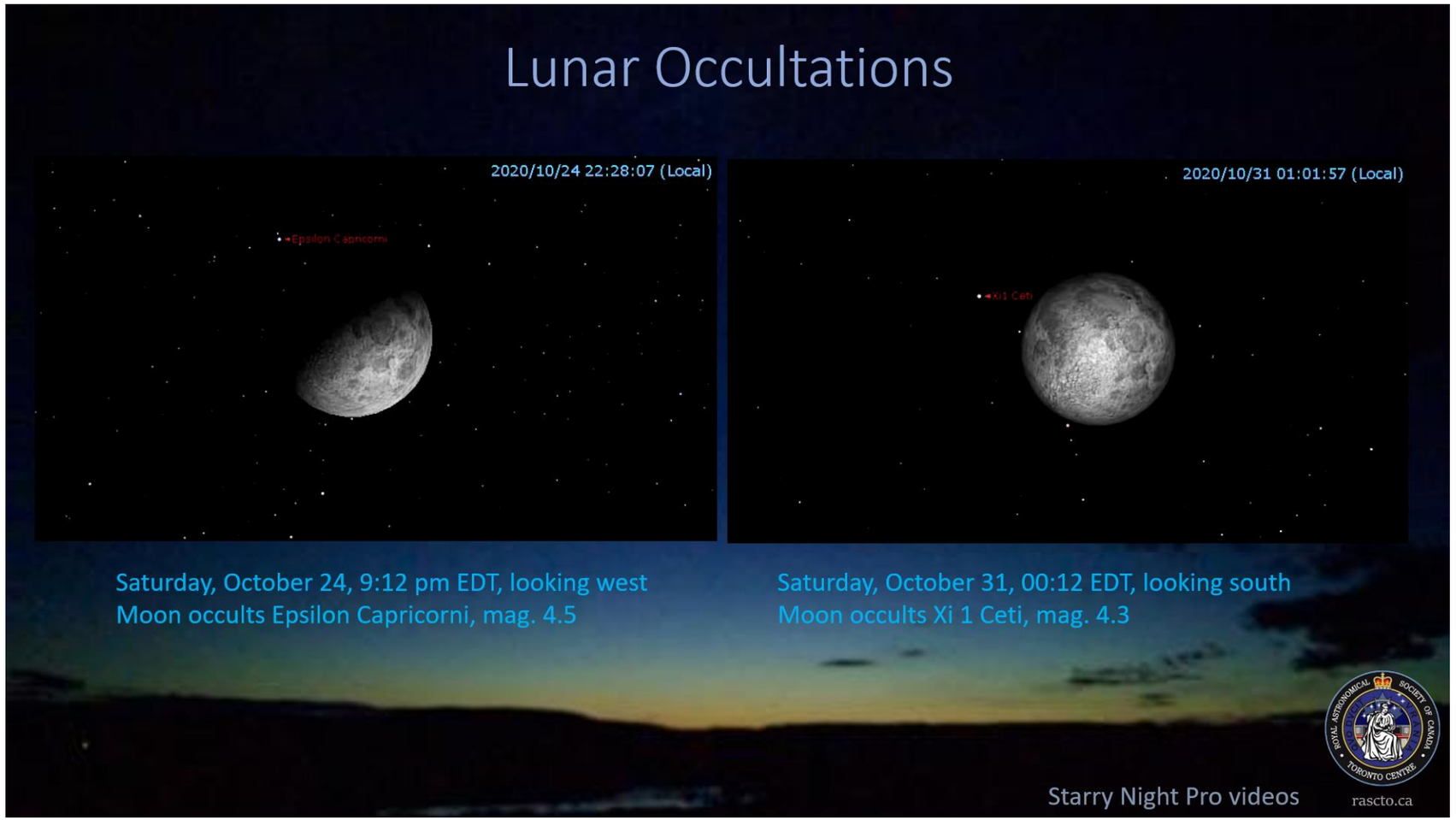
It’s a linear fault on the eastern edge of Mare Nubium, about a third of the way down the southern hemisphere, slightly left of centre.



When 8 days past New, sunrise is occurring along the terminator and the cliff-face stands out in shadow. The fault is very nearly straight and runs for 110 kilometers, is estimated to be around 300 meters higher on the east side, with a slope 2.5 km wide. To its west is Birt Crater, 17 km wide.

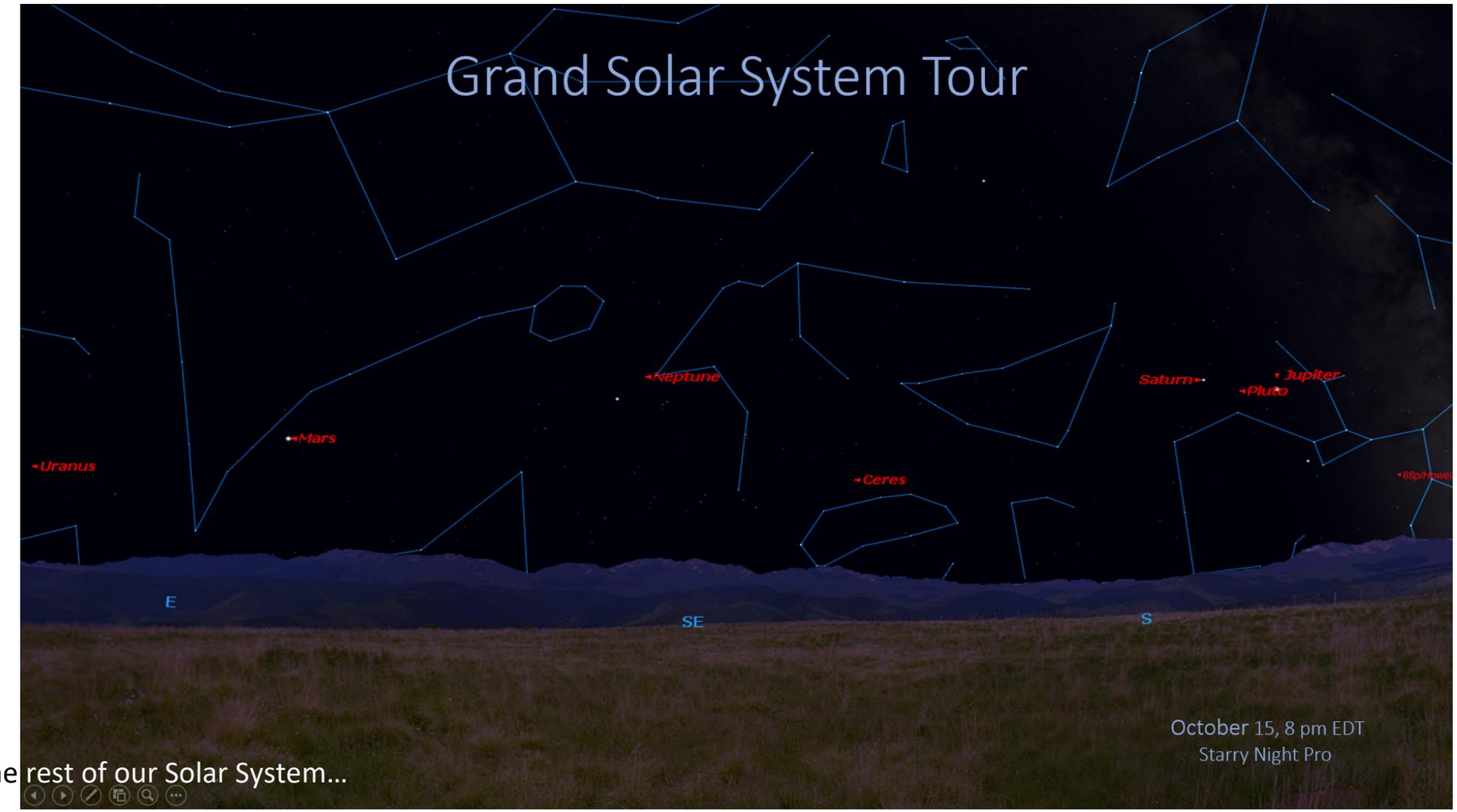
To the northeast of the crater is Rima Birt. It's a slightly curved 50-km-long channel. It could be a former lava tube whose roof collapsed exposing a half-pipe. Its northern end comes down a mound, suggesting a lava dome and this volcanic interpretation. This is definitely an area rich in the Moon's geological history you can study when the Sun is at the right angle.

The image on the right shows this area during lunar sunset when the Straight Wall's cliff-face is dramatically lit. At the south end of the cliff is a curved mountain – what remains of a flooded crater – that looks like a sword's handle guard, with the Great Wall as the blade.



There are two lunar occultations of magnitude 4 stars this month. The first occurs on Saturday Oct 24 with a waxing Moon covering Epsilon Capricorni around 9:12 pm.

One week later, a Full Moon occults Xi 1 Ceti just after midnight Friday into Saturday. Xi 1 Ceti is a tight binary system, separation only 0.012 arcsec, so maybe you can see it wink-out in steps. Their actual separation is 4.2 AU, smaller than the distance between Jupiter and the Sun.



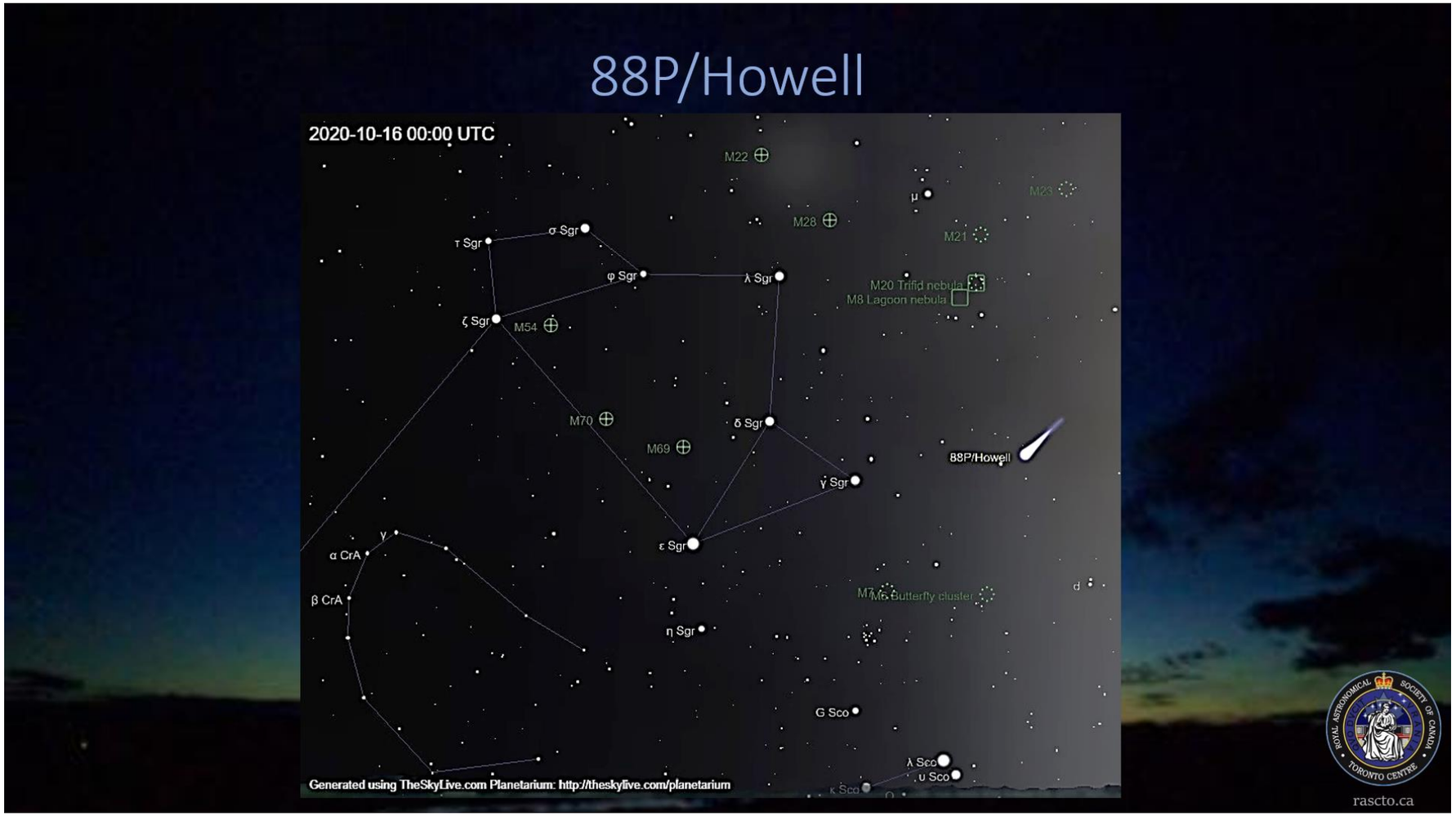
Now the rest of our Solar System…

Here we see a line-up of the 5 superior planets, dwarf planets Pluto and Ceres, and comet 88P/Howell as of 8 pm tomorrow night. Only Mercury and Venus are missing. Venus will rise around 4:15 the next morning. That's 8 hours later so after working your way through these targets, you could get some sleep and head back out around 5 to catch Venus. In order to include Mercury, you will need to wait until the second week of November. Your best chance to see Mercury will be the morning of November 10.

You may also see some meteor streaking across the sky. There are a few meteor showers running or peaking over the next few weeks.

We'll start our tour, like we do when observing, with objects that set first, working our way west to east.

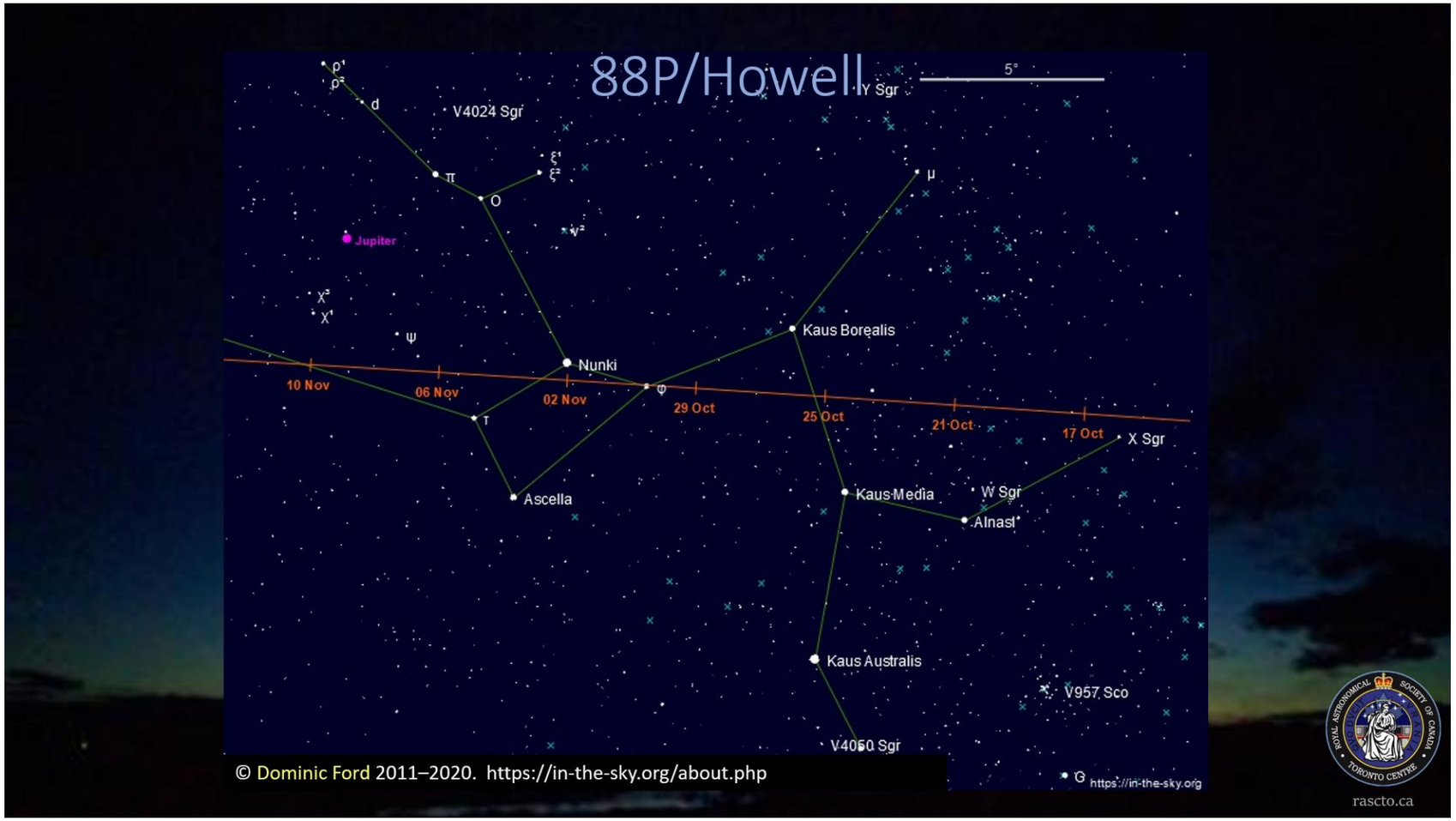
First up is Comet 88/P Howell. Here's an image of it taken 1 month ago by Jose Chambo Bris in Spain.



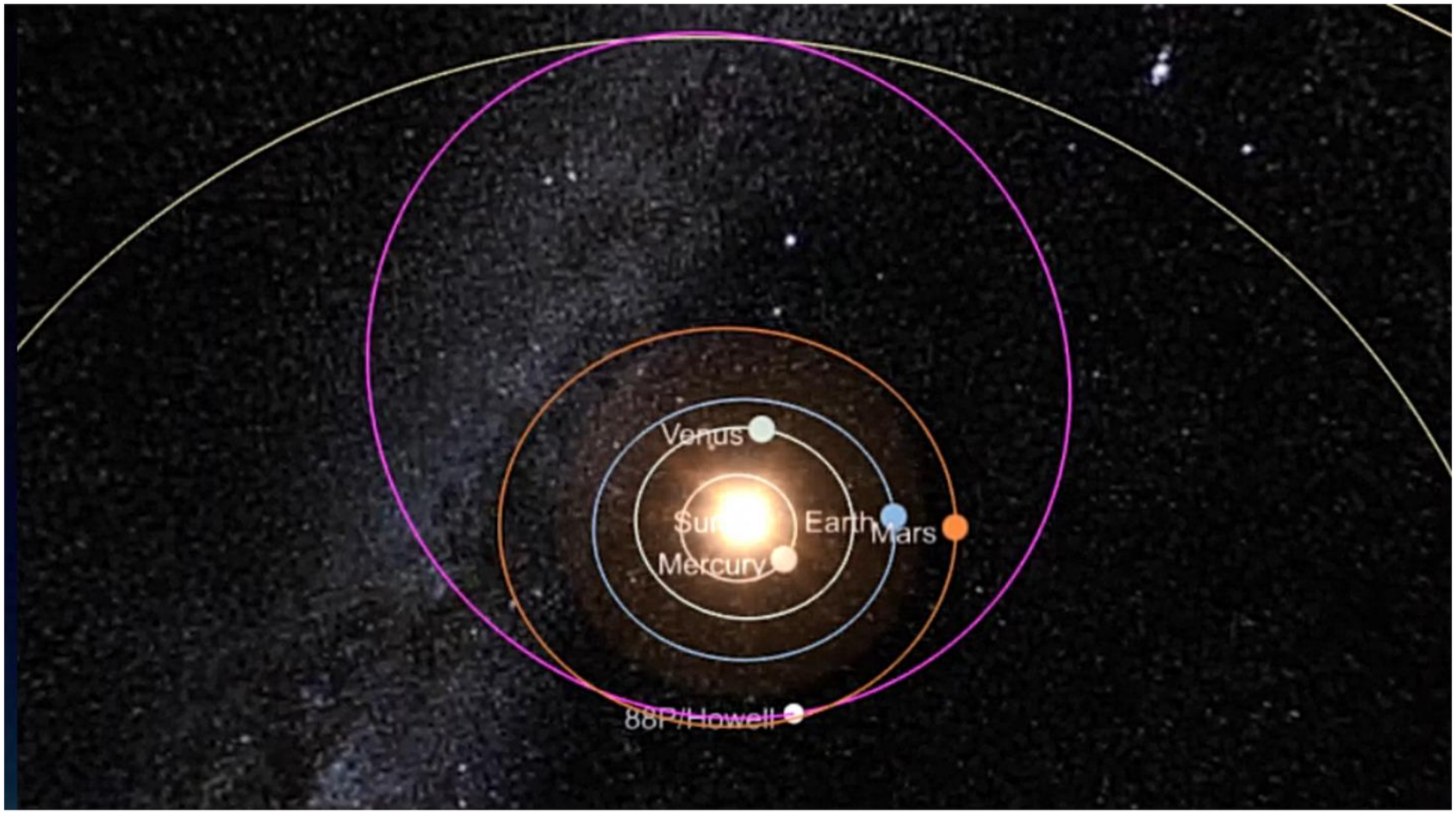
And this is the comet's position Friday night, west of the Teapot's spout.

It was estimated to be at magnitude 9 early in October.

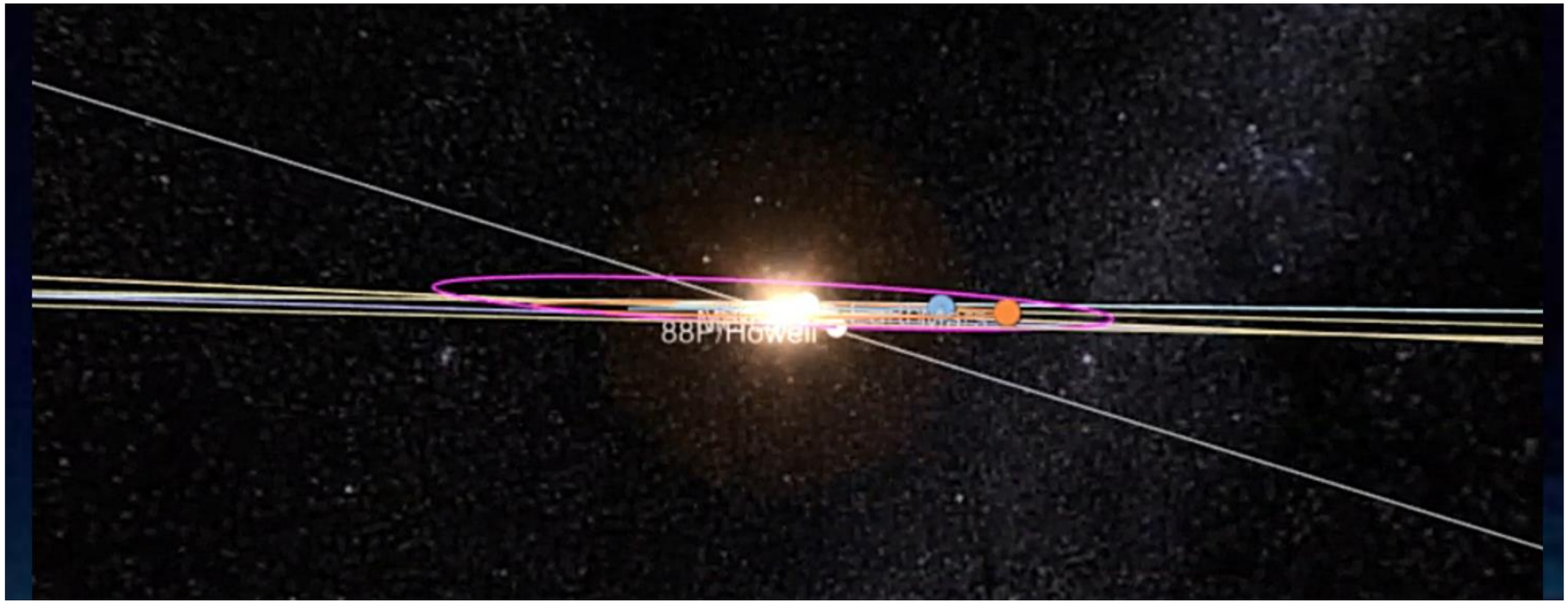
The comet passed perihelion on Sept. 2 and is fading now with Earth's orbit pulling us away from it. It should be possible to see in small telescopes provided there is good transparency near the horizon.



88P/Howell will pass above the teapot spout over the coming week, then through the dome and clipping the handle in early November.



The comet’s 5.5-year elliptical orbit brings it as close to the Sun as Mars, and as far as Jupiter.



Its orbit aligns closely with the ecliptic.

88P/Howell

Hellen S. Howell

46-cm Schmidt telescope

The comet was discovered in August, 1981 by then-student Hellen S. Howell when searching for supernovae at the Palomar Observatory with the retired and famous 46cm Schmidt telescope.

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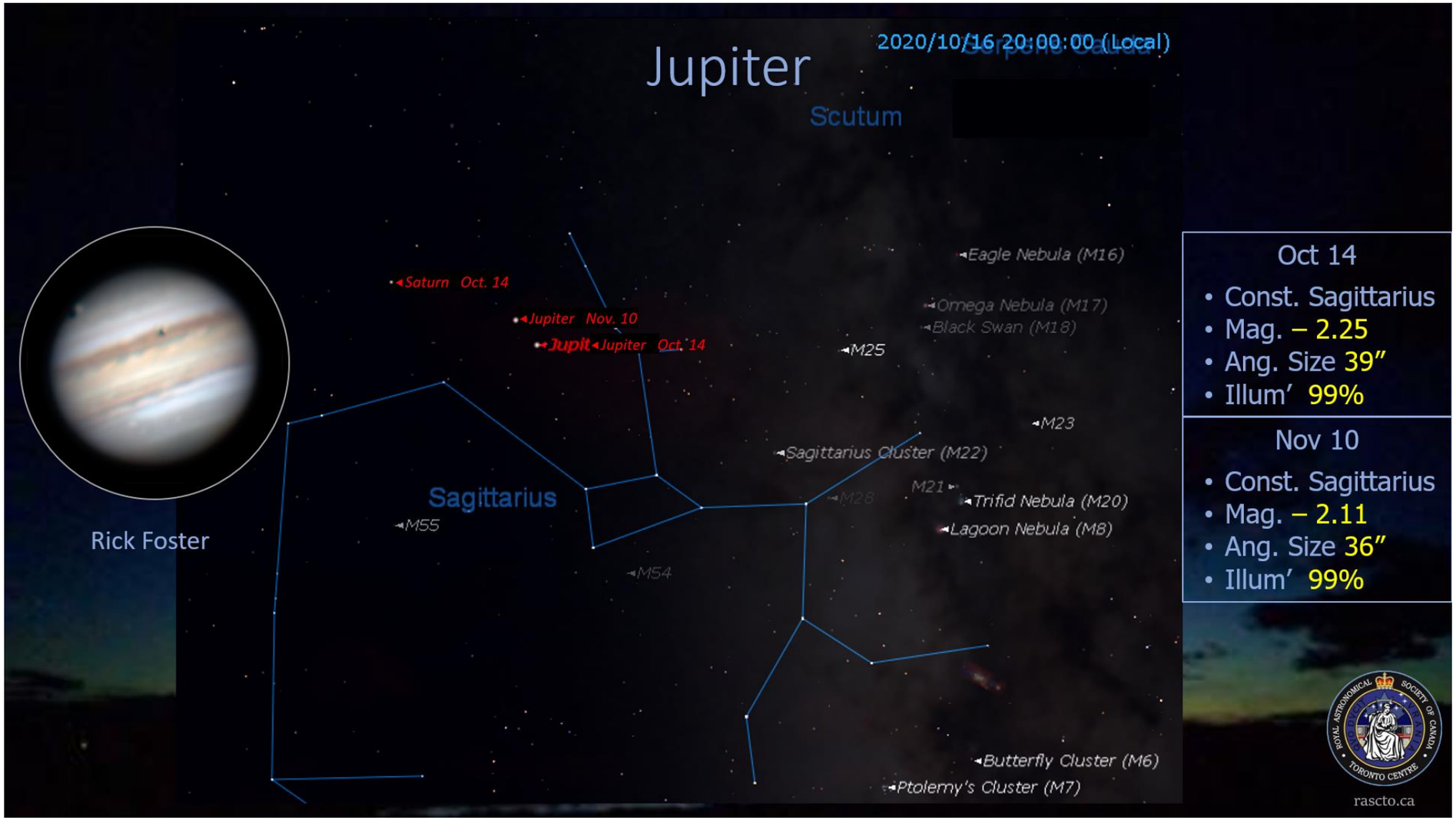

Jupiter is saying its goodbyes after hanging out with us all Summer. It's still quite bright at negative 2.25 tonight and 39 arc seconds wide, dimming a bit by Nov. 10 and shrinking to 36 arc seconds. You can easily spot the planet drifting on the eastern side of Sagittarius, inching ever closer to Saturn. By Nov. 10, the two planets appear 4¼° apart.

Colour filters for observing Jupiter

#8 light yellow	#21 orange	#80A blue	Baader Neodymium
Light overall contrast enhancement	Enhances contrast of polar regions	Enhances belts and Great Red Spot	Overall contrast enhancements
Jupiter's cloud belts are somewhat enhanced.	Enhances the bluish features that can be found in Jupiter's atmosphere, like festoons or the polar regions.	Darkens the orange colored cloud belts and the Great Red Spot and makes them stand out better.	Enhancements are not as strong as with #21 orange and #80A blue, but with the benefit of a neutral look.

Great Jupiter Filter
Simulated small telescope view of Jupiter unfiltered and #80A filtered

http://www.project-nightflight.net/

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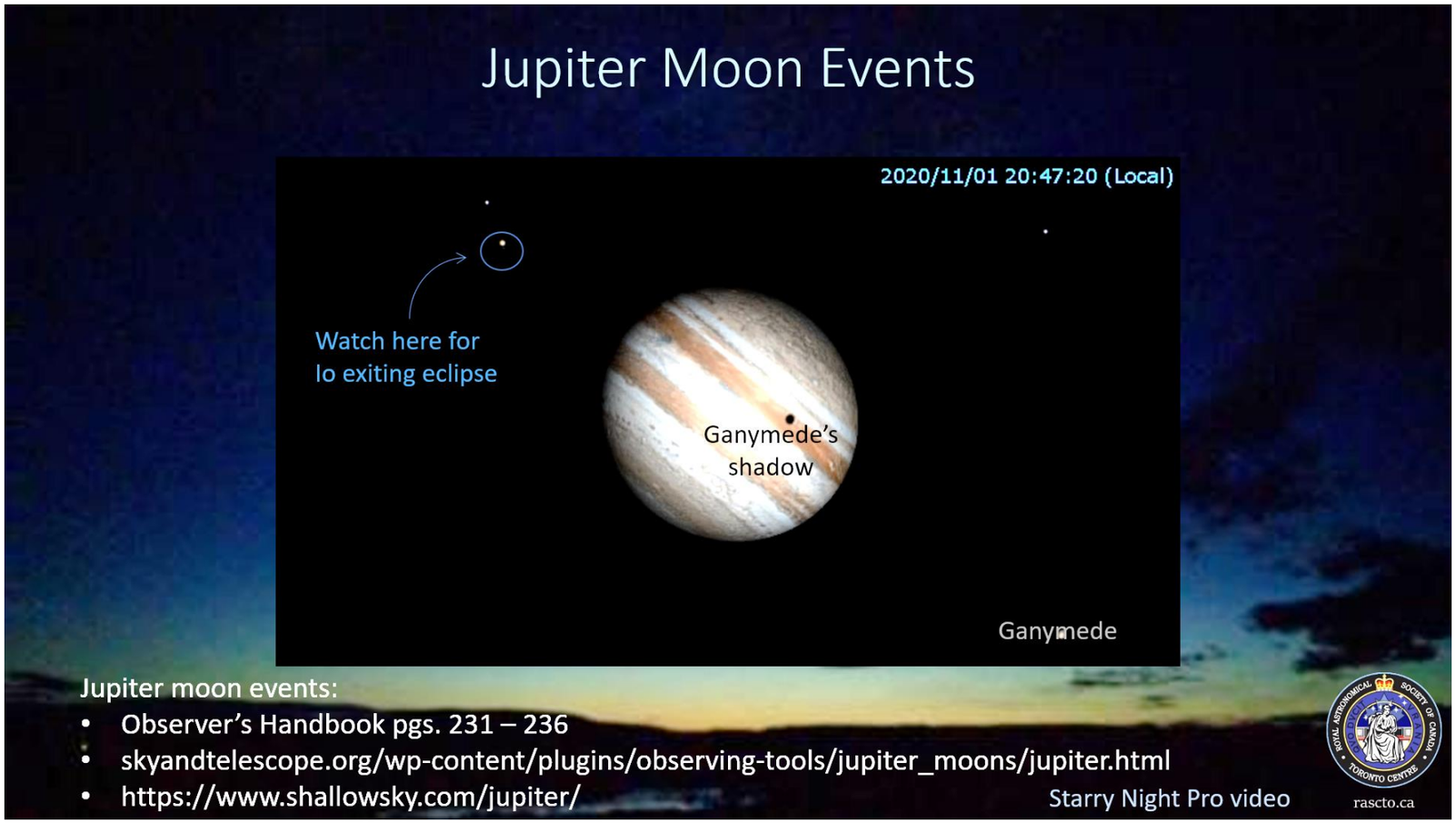
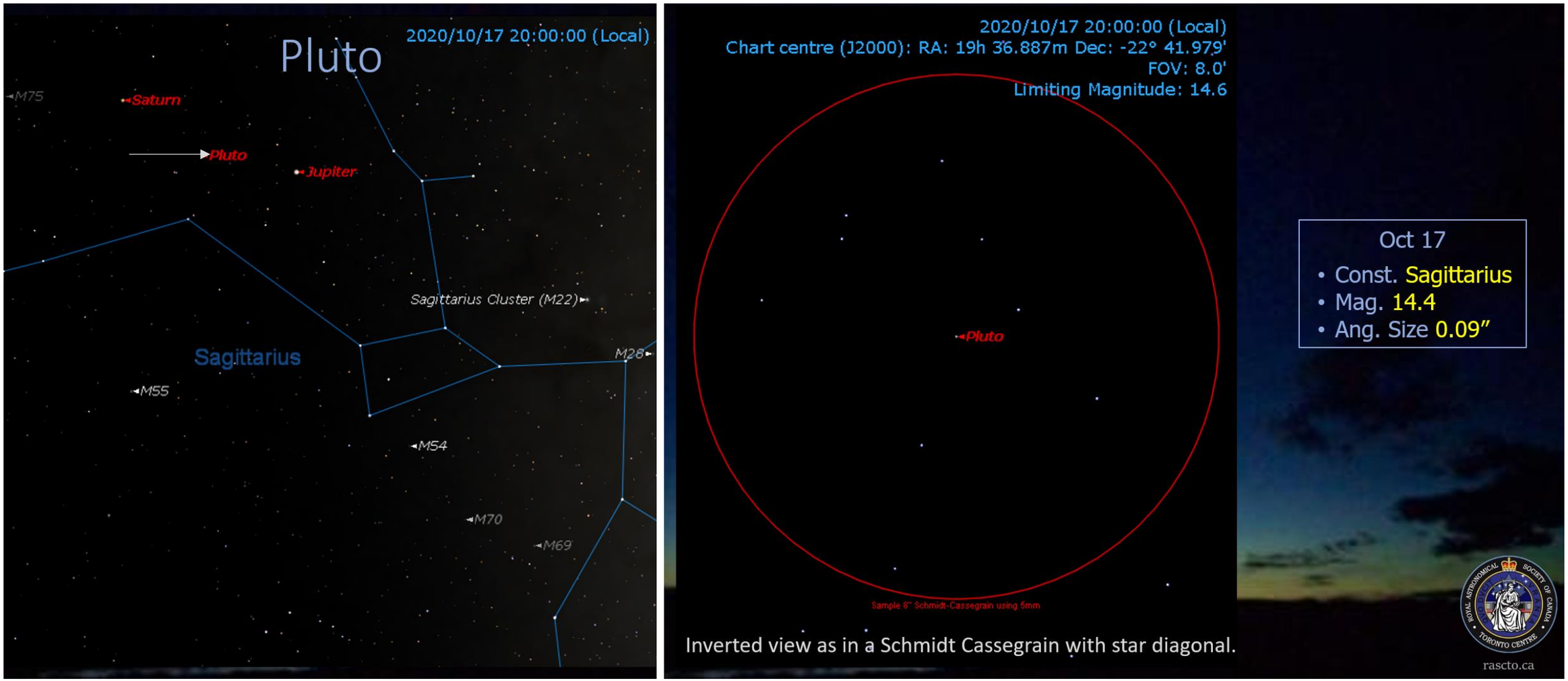


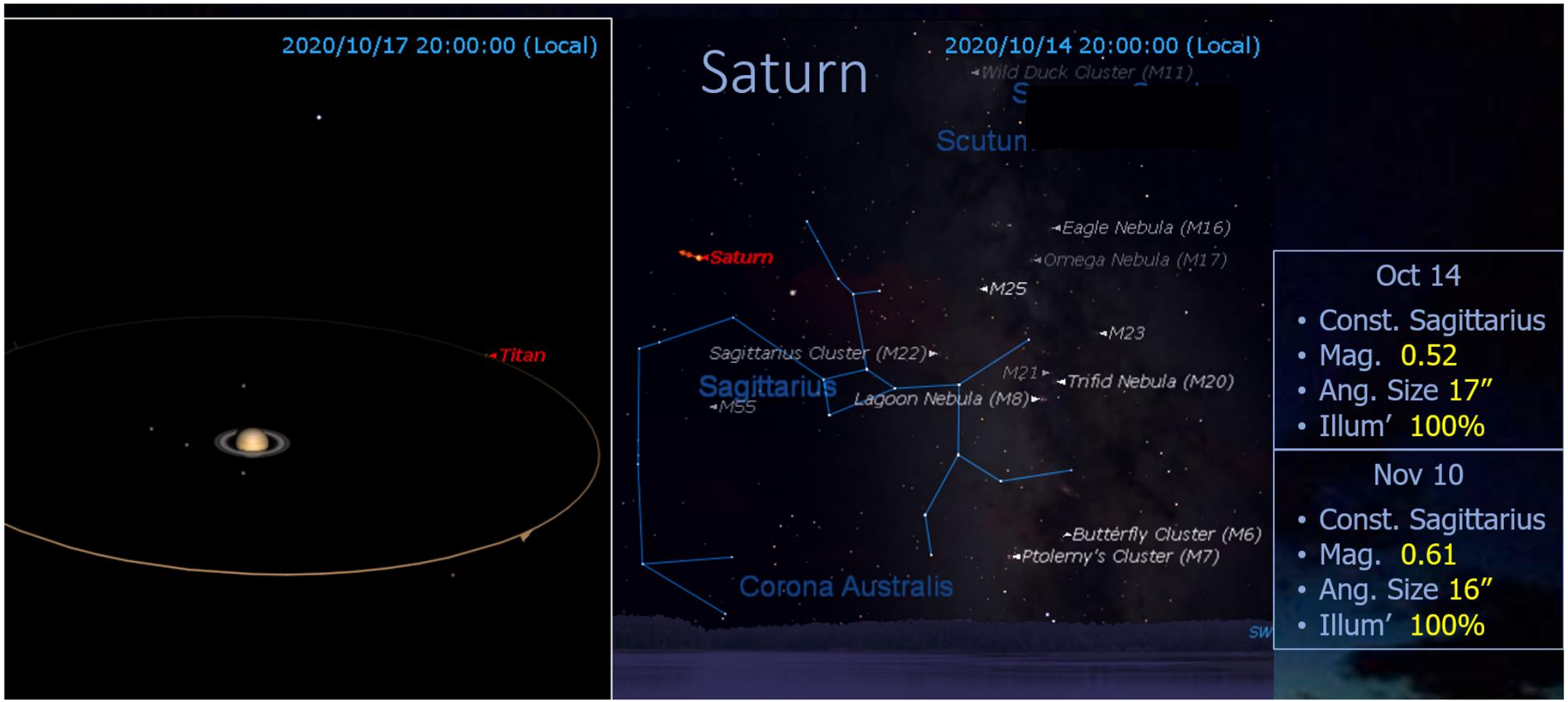
If you like to watch Jupiter's moons, here's a fun one for you. At 8:30 in the evening on Sunday, November 1, you can watch Io exit from Jupiter's shadow while Ganymede's shadow transits Jupiter.

You can look-up Jupiter moon events in the Observer's Handbook or at these websites.
https://skyandtelescope.org/wp-content/plugins/observing-tools/jupiter_moons/jupiter.html
https://shallowsky.com/jupiter/



Moving east, Pluto is the next Solar System object.

Under ideal conditions, a 10-inch telescope should be able to see down to mag 14.7, making it possible to glimpse Pluto. The image above from Starry Night Pro has the field flipped right to left to match the view in an SCT with a star diagonal, with stars down to mag 14.6, slightly dimmer than Pluto at 14.4. Good luck!



On to Saturn.

Saturn is also east of the Teapot, drifting slightly eastward over the next 4 weeks. The rings are tilted near their max, showing us their northern face. You can double the angular size of the target by including the width of the rings.

Titan is usually easy to spot. If you have a large telescope, you might also pick out some of Saturn's other moons, the faint dots you see here near the planet – Rhea, Dione, Enceladus and Tethys, and Iapetus just outside Titan's orbit.

Colour filters for observing Saturn

#8 light yellow	Baader Neodymium
Light overall contrast enhancement	Light overall contrast enhancement
With a small telescope, the #8 works especially well for Saturn's cloud belts and polar regions. These low contrast features may be hard to discern in a small telescope - the light yellow filter can make the difference.	The Neodymium filter mildly enhances the cloud belts, comparable to the filter #8 light yellow.

Great Saturn Filter
Simulated small telescope view of Saturn unfiltered and #8 filtered

http://www.project-nightflight.net/

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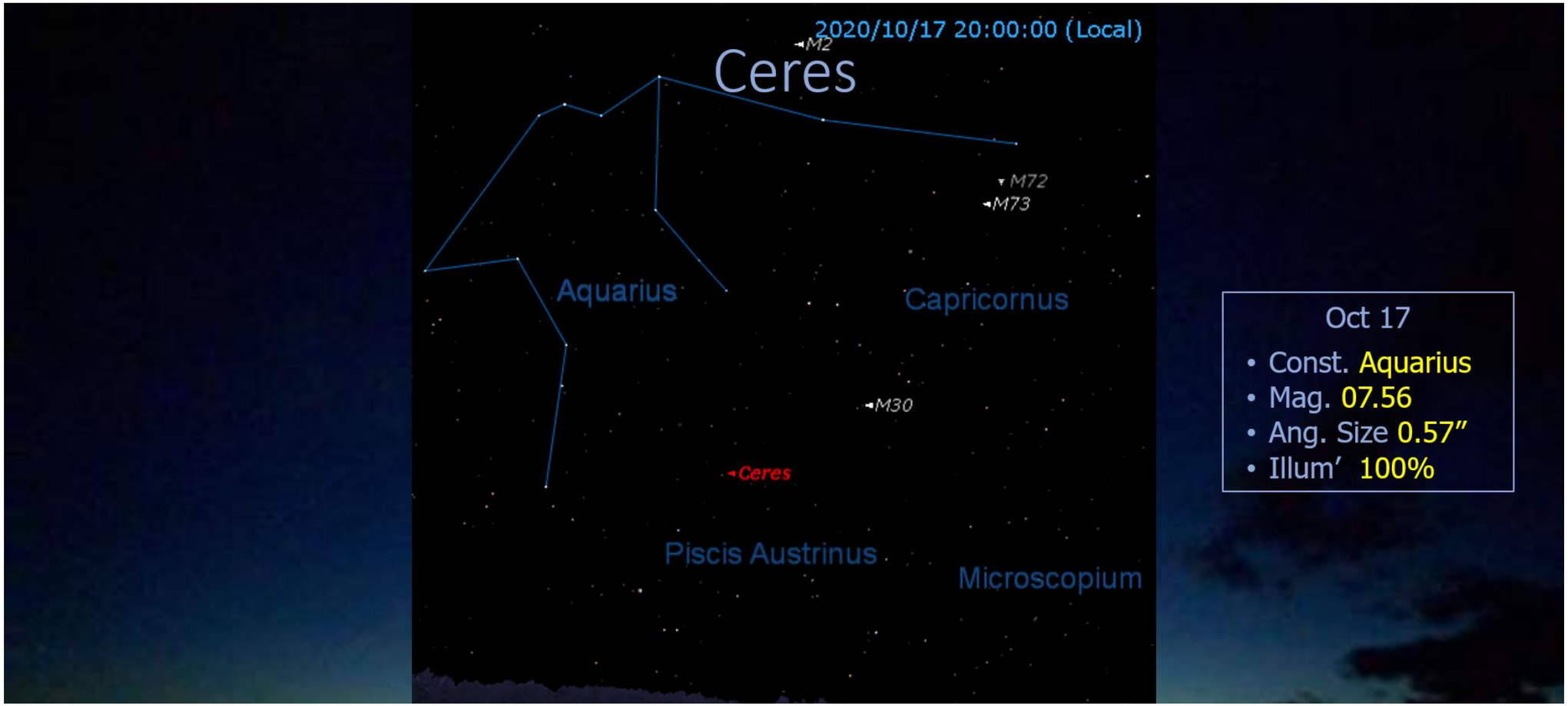
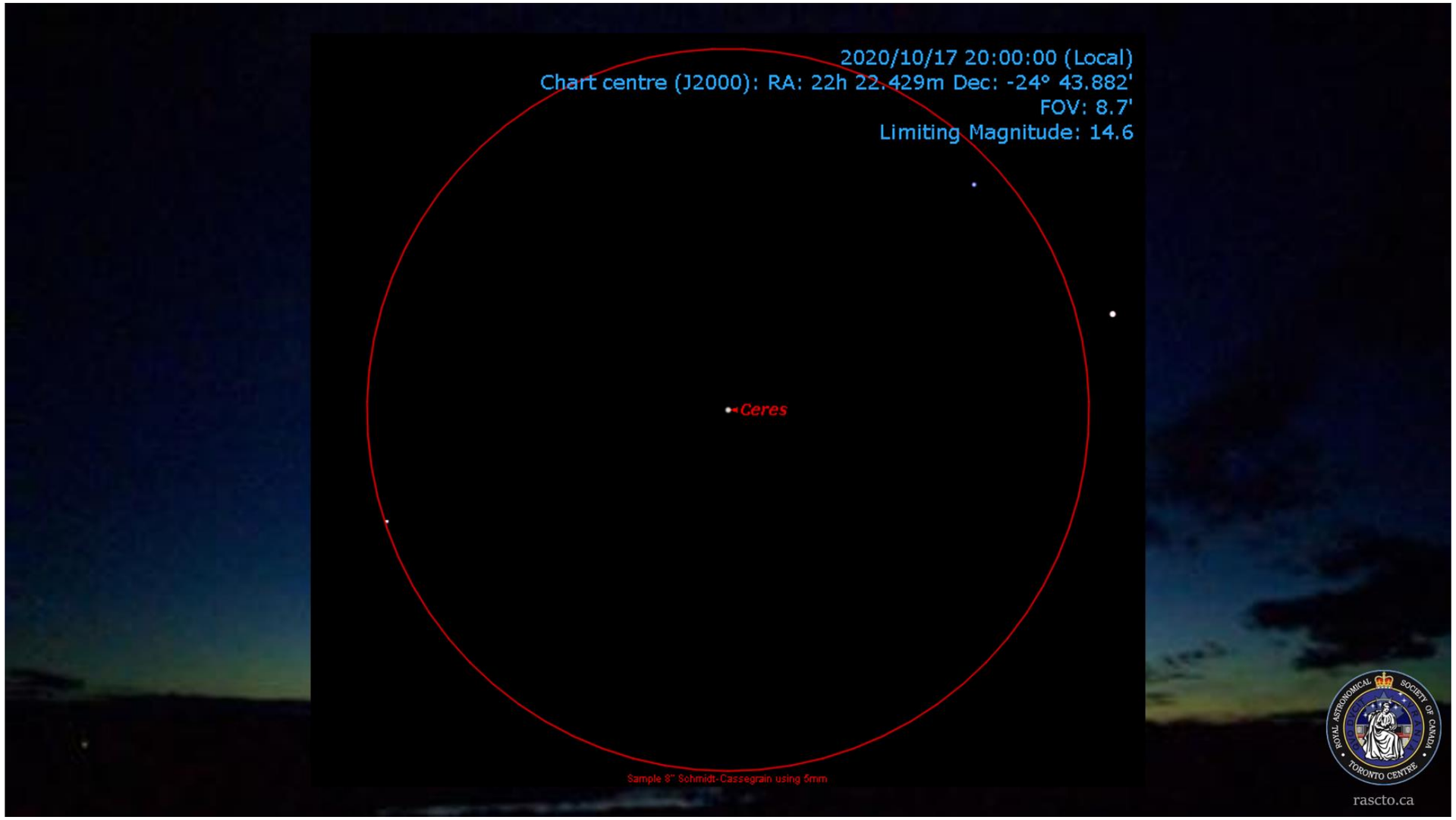
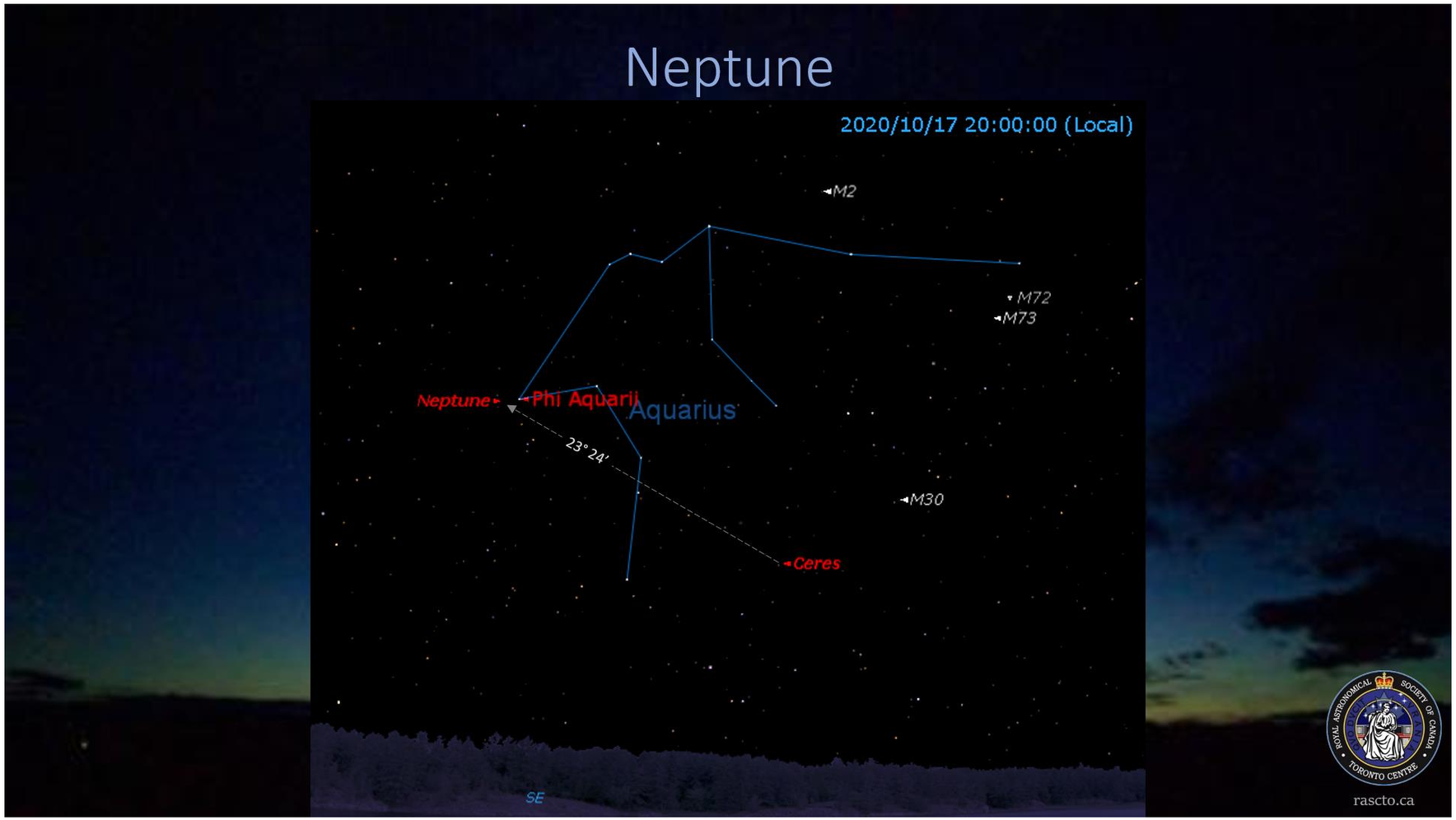


The dwarf planet *and* asteroid Ceres passed opposition 6 weeks ago. Its apparent magnitude sits at 7.56. Any size binoculars or telescope can spot it.

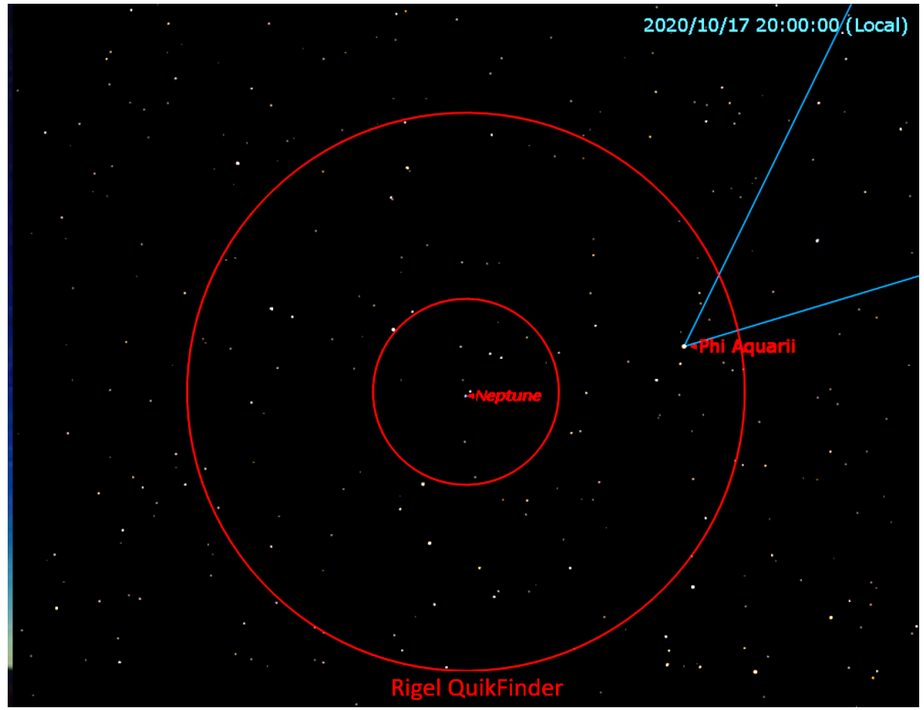


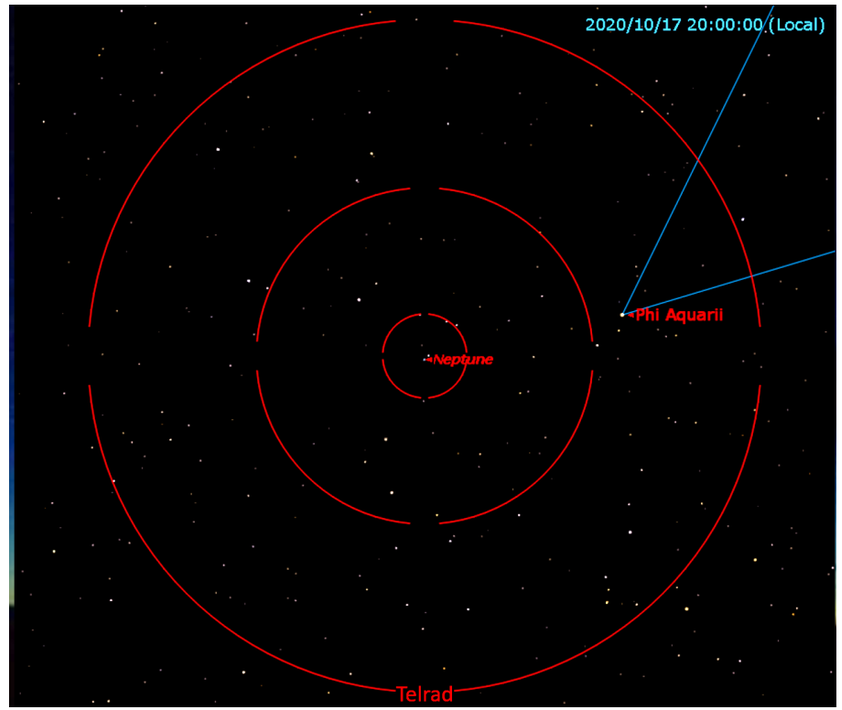
Here's an 8-arcminute-wide *inverted* field of view, centred on Ceres. It's in a star-poor area, with only 3 brighter than mag 14 visible around Ceres. Ceres is the brightest dot in the field, making it easy to spot.

Neptune



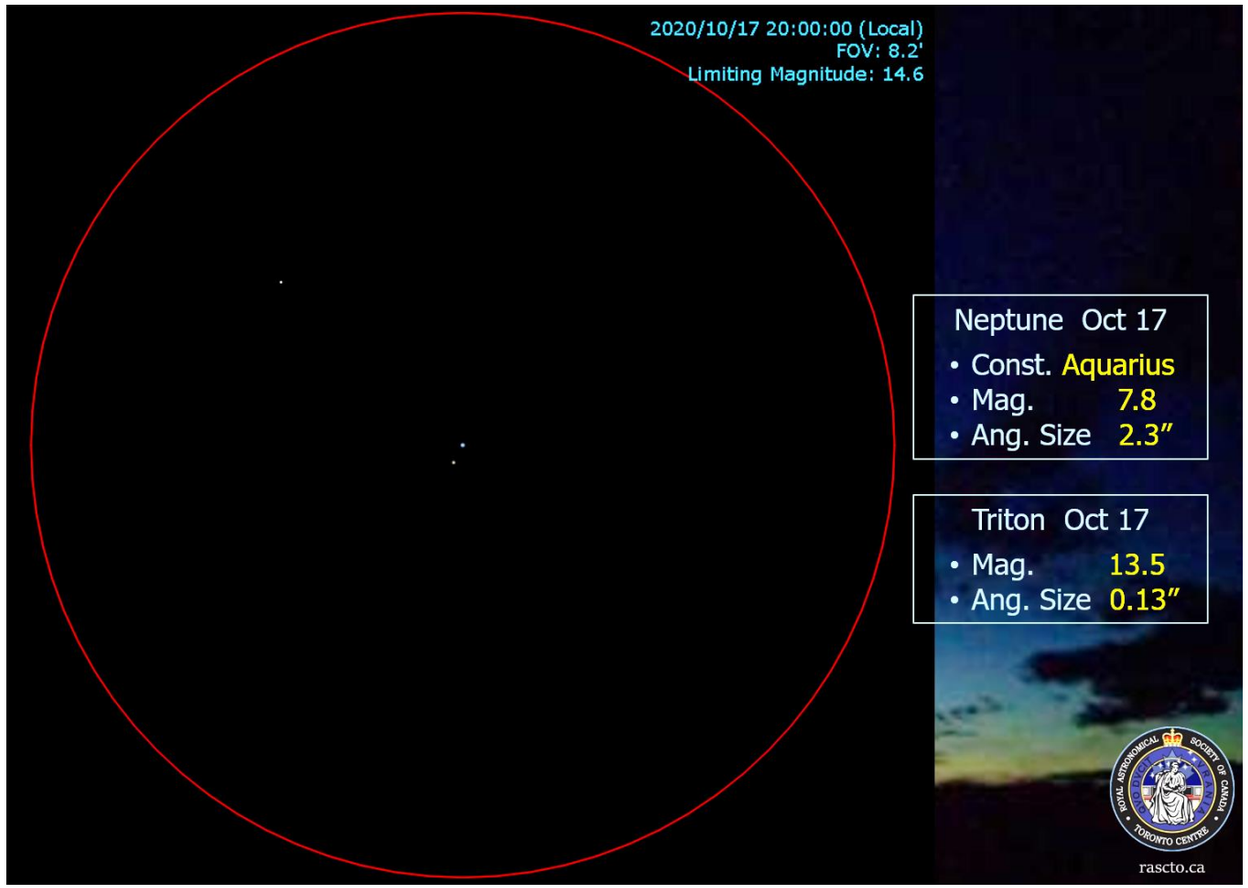
From Ceres, it’s a jump of 23 and 1/3 degrees north east to arrive at Neptune.





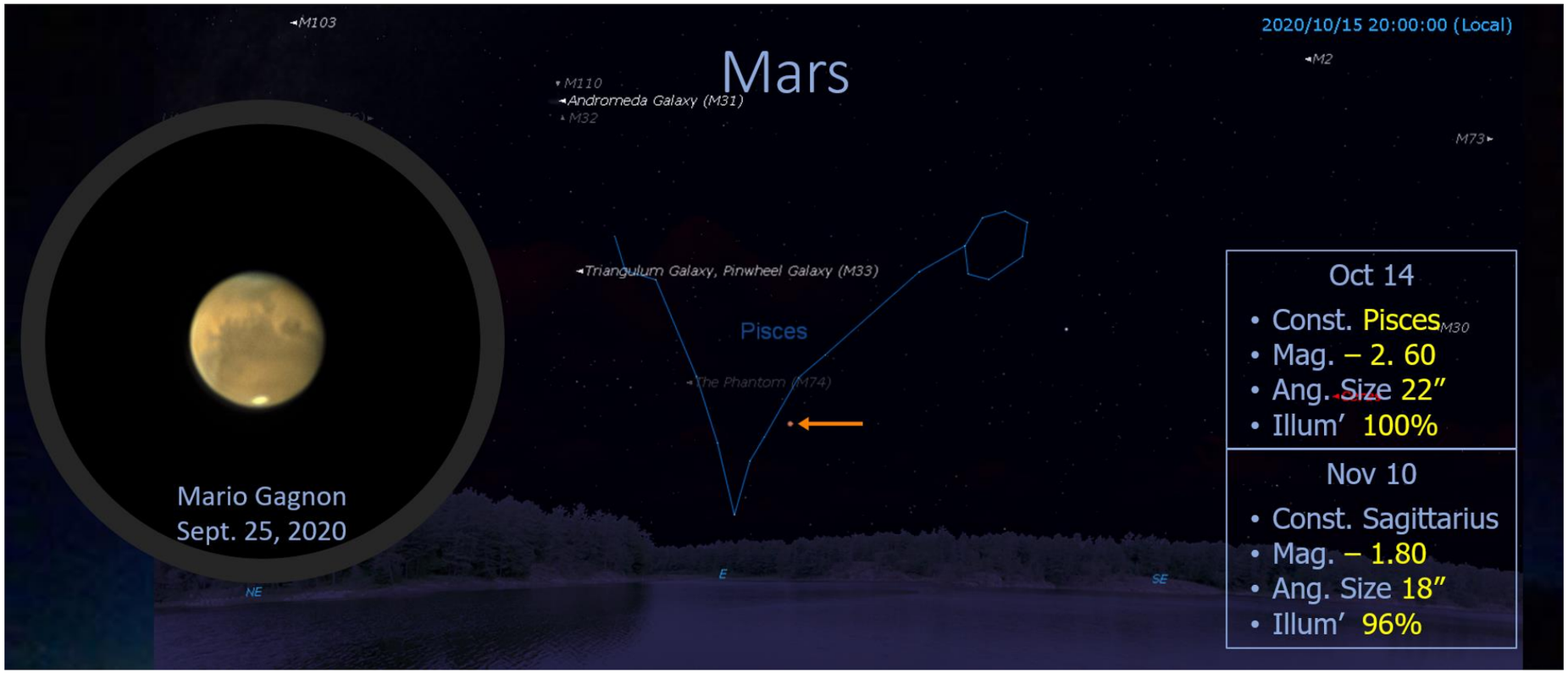
Use Phi Aquarii to help aim your telescope on Neptune.

Here are the views through a Rigel QuikFinder and a Telrad showing where to place the star to aim at Neptune.



And here's a close-up, inverted, inside an 8 arc-minute field of view. Neptune is the blue circle in the centre, with Triton the small dot beside it. To the upper left is an 8.7 magnitude star.

Neptune can be seen in binoculars or telescope and is easy to recognize by its blue colour. You'll need a 12-inch telescope to spot its moon Triton that orbits Neptune backwards (east to west). Triton's orbit is slowly decaying. Within 100 million years, it will come so close that Neptune's tidal forces will tear Triton apart and turn it into a ring.



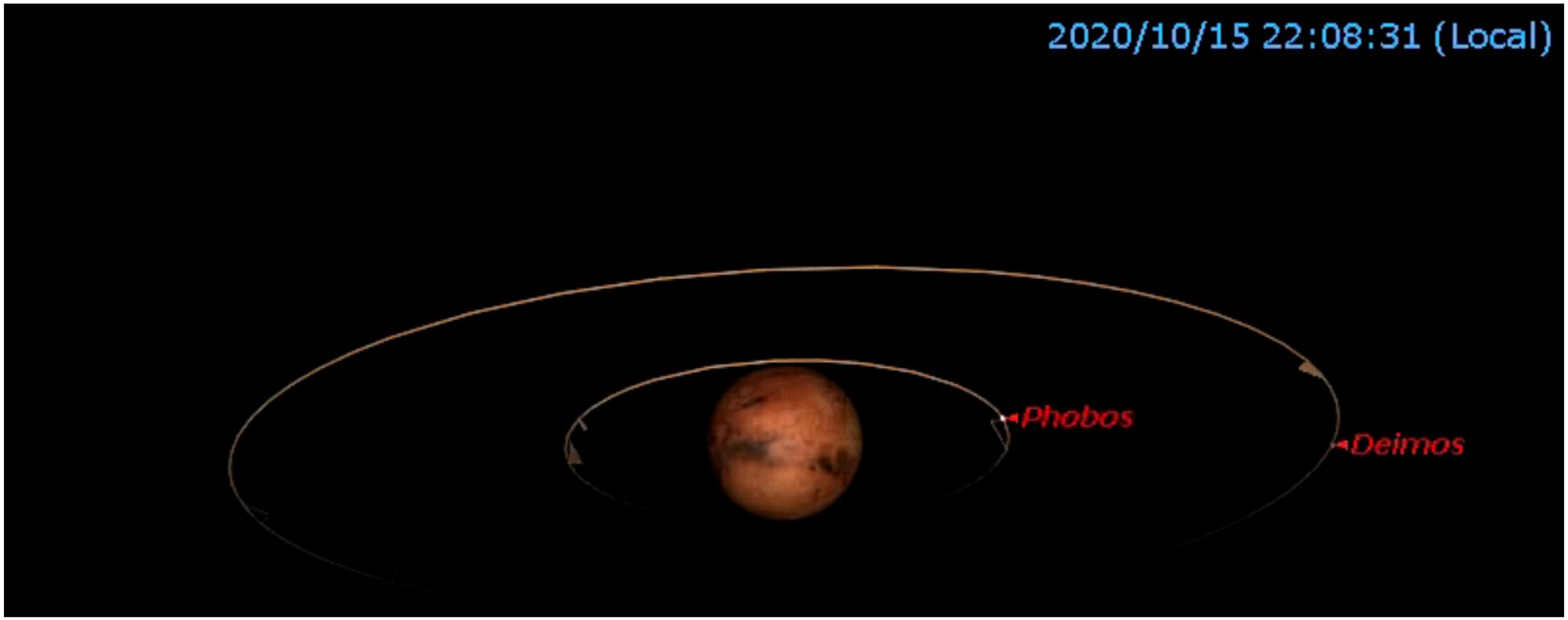
And now we come to MARS, which reached opposition at 7:18 pm last night, and is probably as good as it gets for observing from southern Ontario right now.

Mars was even closer in August 2003, with an angular size of 25 arc seconds compared to 23 arc seconds at closest approach a week ago. But back in August 2003, Mars was only 30° high when transiting the meridian, so we were looking through 2 airmasses when observing it. This week, we’re looking through only 1.3 airmasses because Mars is 51° high at the Meridian. The 2 arc seconds we lose in angular size compared to 2003 is compensated by steadier seeing, allowing us to study details, with Mars **21° higher** in the sky.

Notice how rapidly Mars drops in magnitude and angular size by Nov 10. Don’t delay.

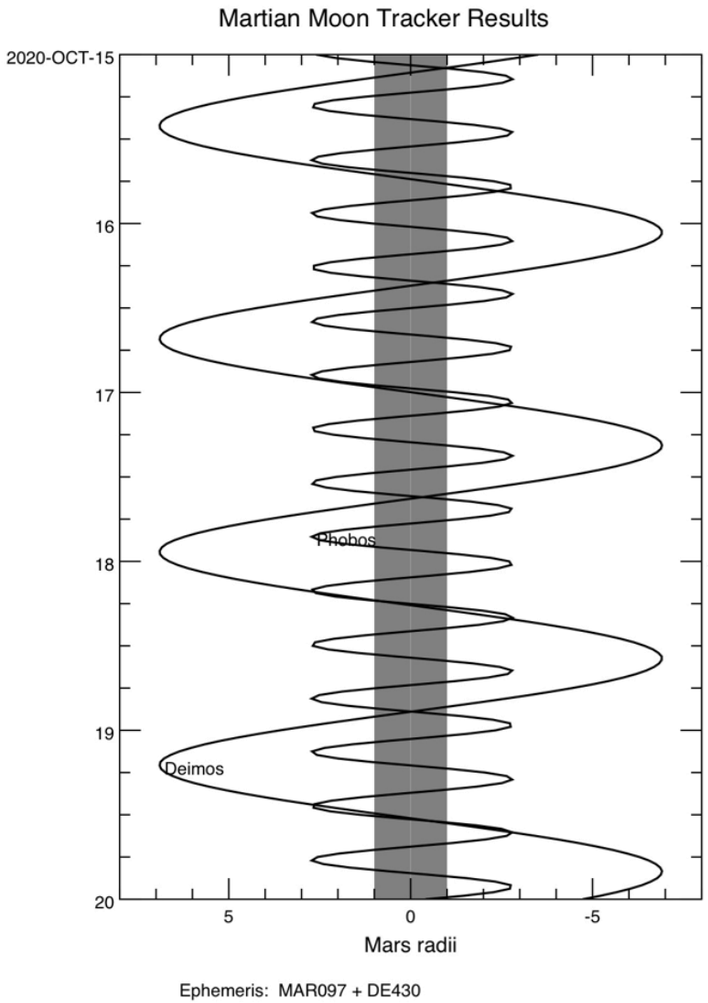
For details on the surface features of Mars that we can observe, see Chris Vaughan's presentation from last month.

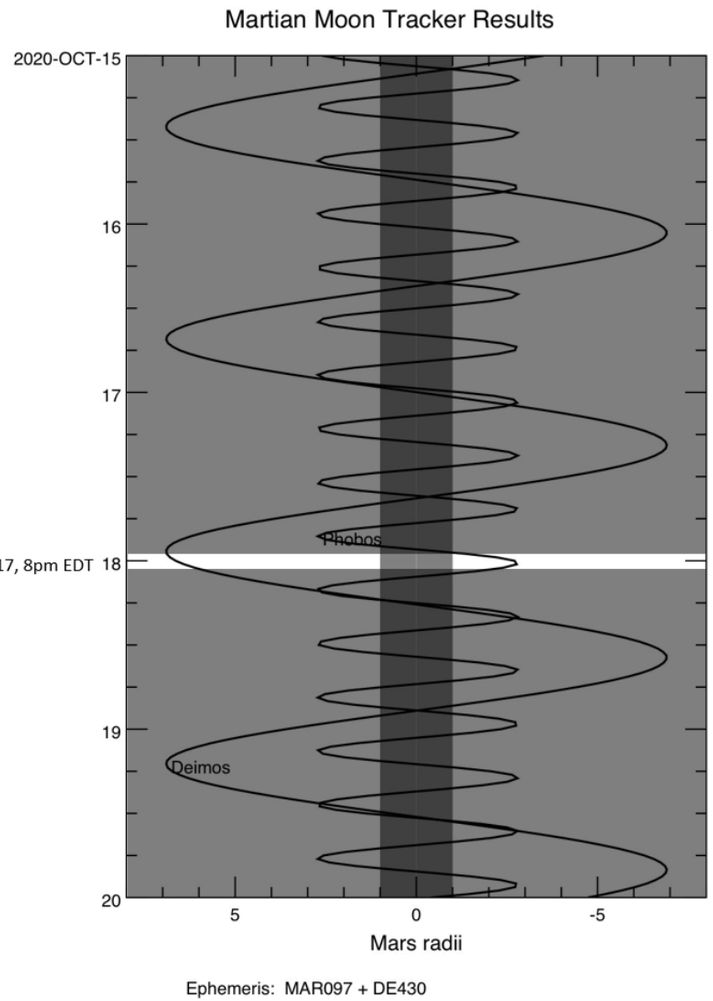
https://www.youtube.com/watch?v=CAWWfRNvFXY&t=224s



With Mars so close right now, it should be possible, with a 10-inch or larger telescope, to spot the tiny moons of Mars, Phobos – 22.2 km wide – and Deimos – 12.6.

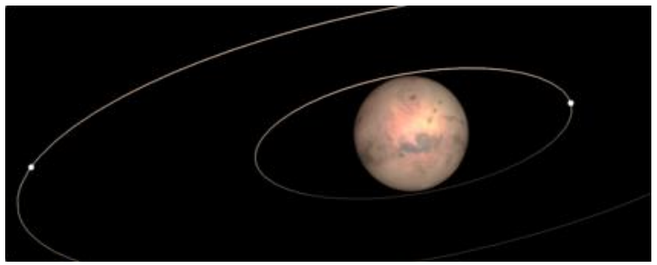
They orbit Mars rapidly. Deimos takes 30.35 hrs. to circle Mars, Phobos needs only 7.66 hours.





Martian Moon Tracker 2.6

https://pds-rings.seti.org/tools/tracker2_mar.html

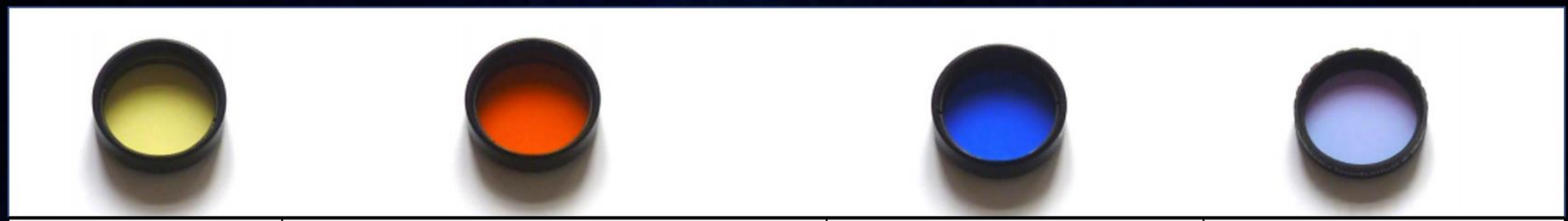


This chart – showing the positions of the two moons over time – is generated by Martin Moon Tracker using time parameters you input.

The trick to seeing Phobos and Deimos is to catch them when furthest from the glare of Mars.

Over the next 5 days seen in this chart, there's a good opportunity around 8 pm EDT this coming Saturday.

Colour filters for observing Mars



#8 light yellow	#21 orange	#80A blue	Baader Neodymium
Light overall contrast enhancement	Enhanced contrast of dark albedo features	Enhanced contrast of polar caps and limb haze	Overall contrast enhancements
The dark albedo features on Mars stand out a bit more prominently.	The #21 orange filter is very useful to enhance the dark albedo features on Mars. These have a bluish/greenish hue. With the #21 in place they stand out better against the bright orange background of the planet's disk.	Since the blue filter darkens Mars' orange disk, it works great to bring out the polar ice caps and the white or bluish limb haze.	Enhancements are not as strong as with #21 orange and #80A blue, but with the benefit of a neutral look.

Great Mars Filter
Simulated small telescope view of Mars unfiltered and #21 filtered

http://www.project-nightflight.net/

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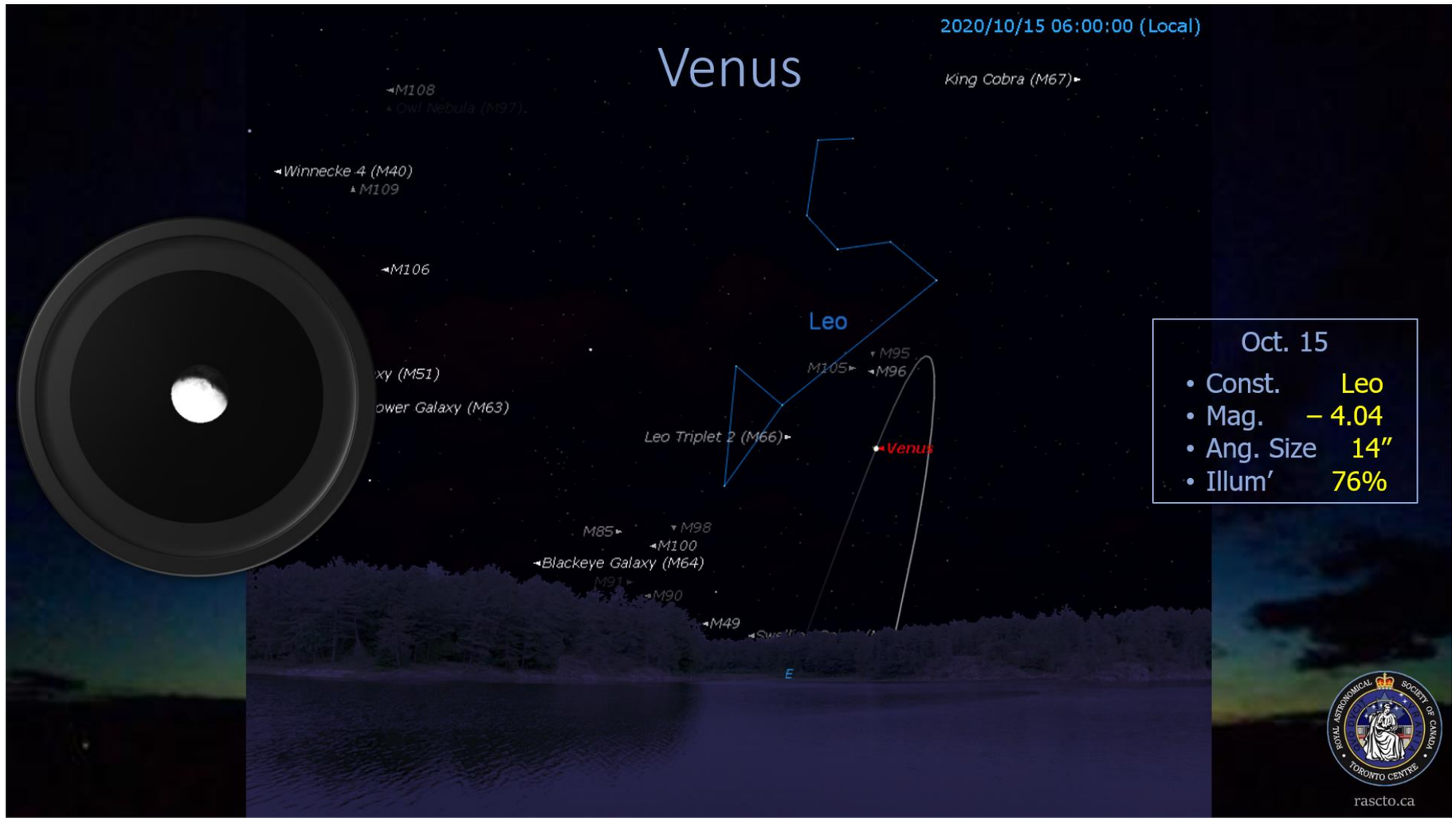
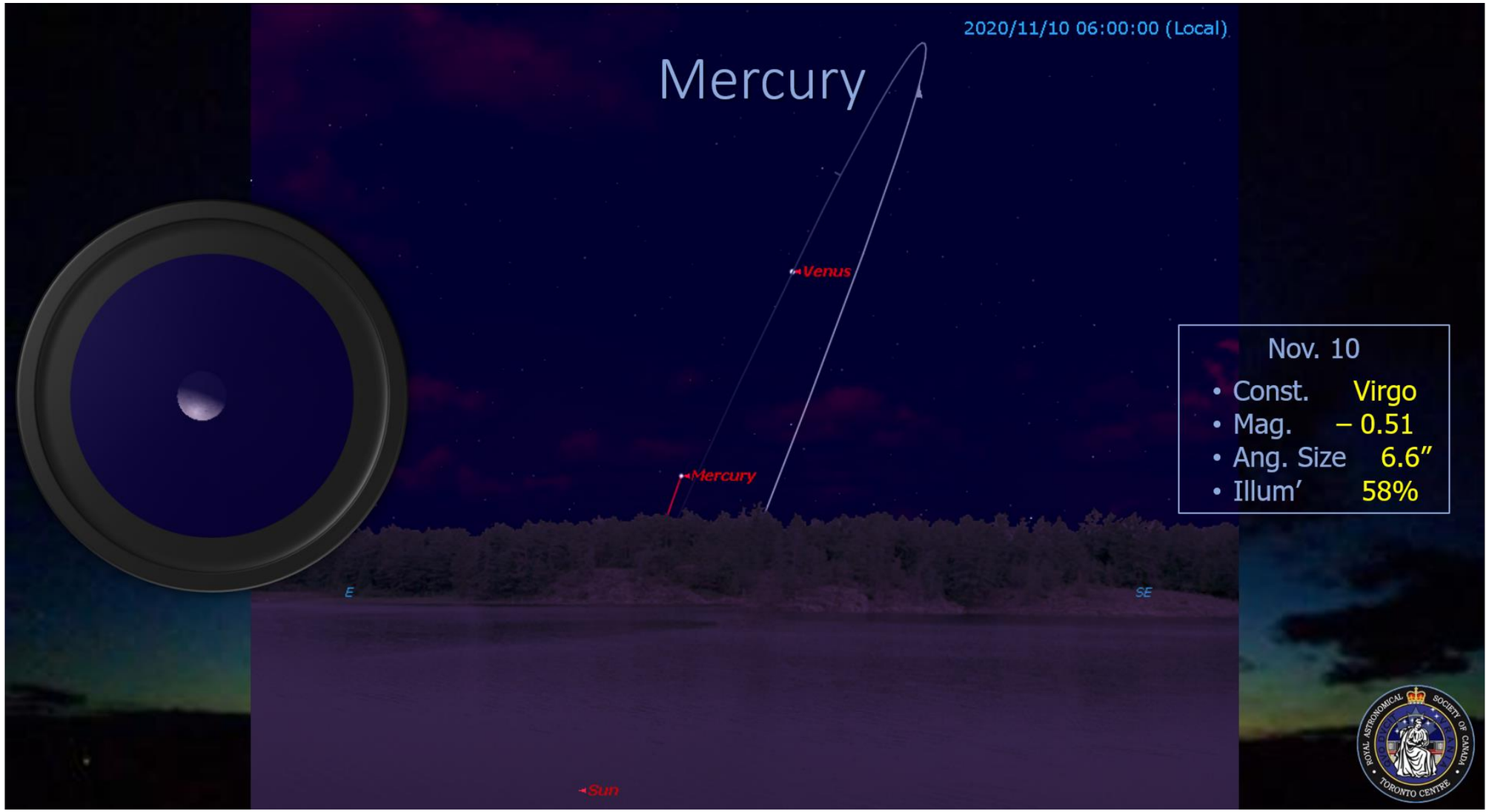
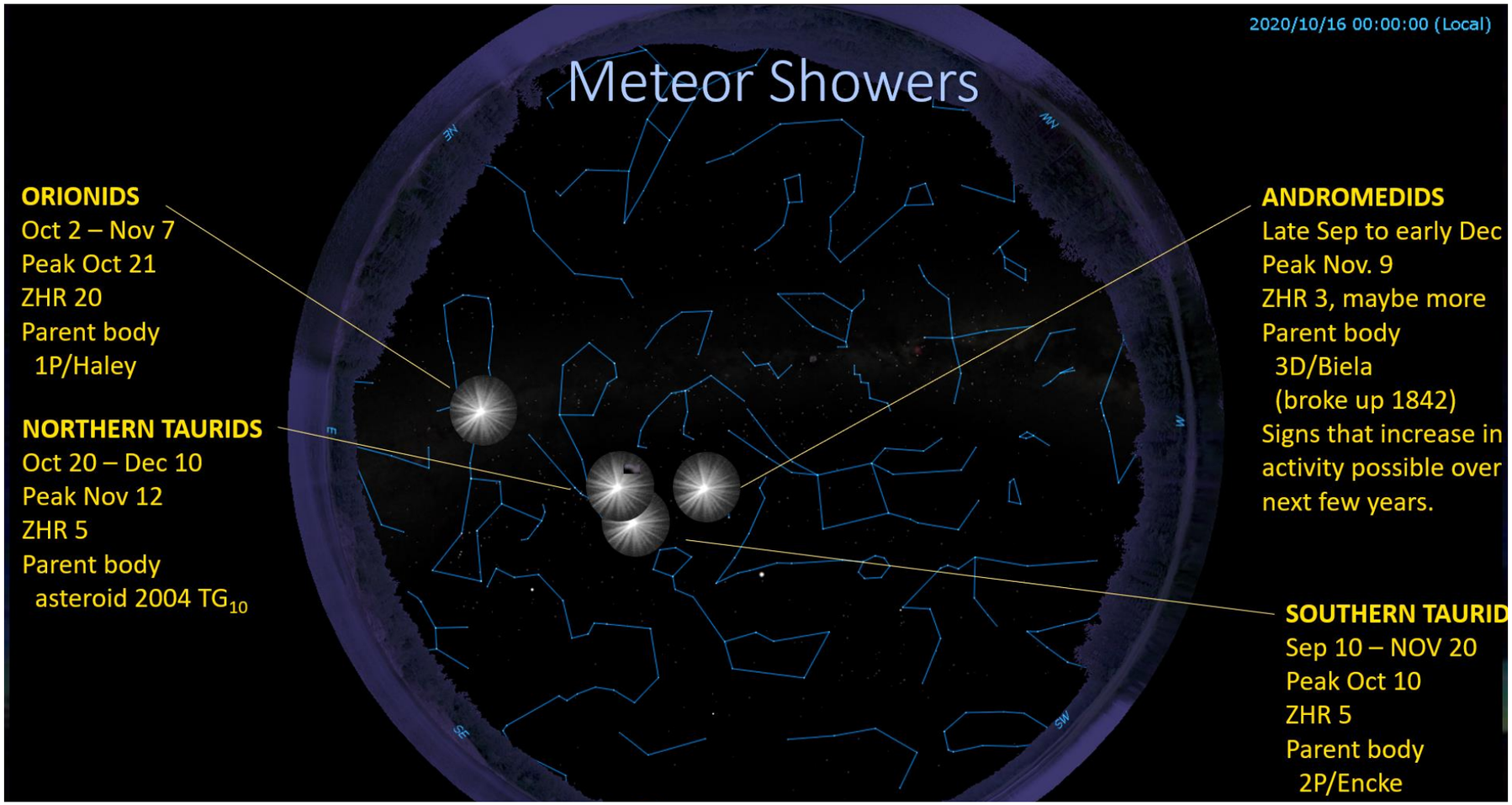


If you're up before dawn, you can catch Venus as it continues its plunge down behind the Sun. At 6 am tomorrow morning, Venus will be 18° high with Astronomical Dawn just beginning. Venus will be gibbous, 76% illuminated, and still brilliant at -4 magnitude.

Seeing its phase in a telescope can be a challenge due to the planet's glare. As the sky brightens, the contrast between Venus and the sky lessens, and that cuts the glare making the phase easier to see. You can also try a neutral density filter – or Moon filter – to cut the glare.



Our best chance to see elusive Mercury is before dawn in the east on November 10. That is the date of Mercury’s greatest western elongation from the Sun, when it rises as far in advance of the Sun as possible. And with the ecliptic fairly steep in Fall mornings, this helps Mercury climb high ahead of the Sun. At 6 am on Nov 10, Mercury is already 7° up, and will reach 11° by 6:30, with the Sun still 6° down. This should give you a good opportunity to hopefully catch a glimpse of Mercury’s half-lit phase. But, give it up after 6:45 as the Sun is getting dangerously close to rising.



There are a few meteor showers occurring now. Working our way clockwise in this diagram, we'll start with the Andromedids. Its parent body no longer exists, having broken up in the 1840s. Zenith Hourly Rates rates have dropped to only 3 over the last century, though a future increase has been predicted as Earth approaches one of two patches of debris from the break-up.

The Northern and Southern Taurids overlap in their timings, not surprising since they have common ancestry. The southern component's parent is comet 2P/Encke; the northern Taurids parent is asteroid 2004 TG_{10} which is believed to be a fragment from comet Encke. Both have a ZHR of 5; call it 10 together.

Saving the best for last, the Orionids are currently showering, and are expected to peak a week tonight with a ZHR of 20. With a number of showers running concurrently, you stand a good chance of catching some if you just lie back and look up over the next few weeks. Of course, watching without Moon interference helps, so your best opportunities are mid-month when the Moon is New or close to it.

Some of these showers produce fireballs; there were two reported to the International Meteor Organization last week, one over South America and one over France.

The IMO encourages public reports on Fireballs as well as submissions on meteor shower observations. It's an easy and fun way to engage in citizen science without an investment in expensive gear. You can visit their website to learn more, join, and contribute.

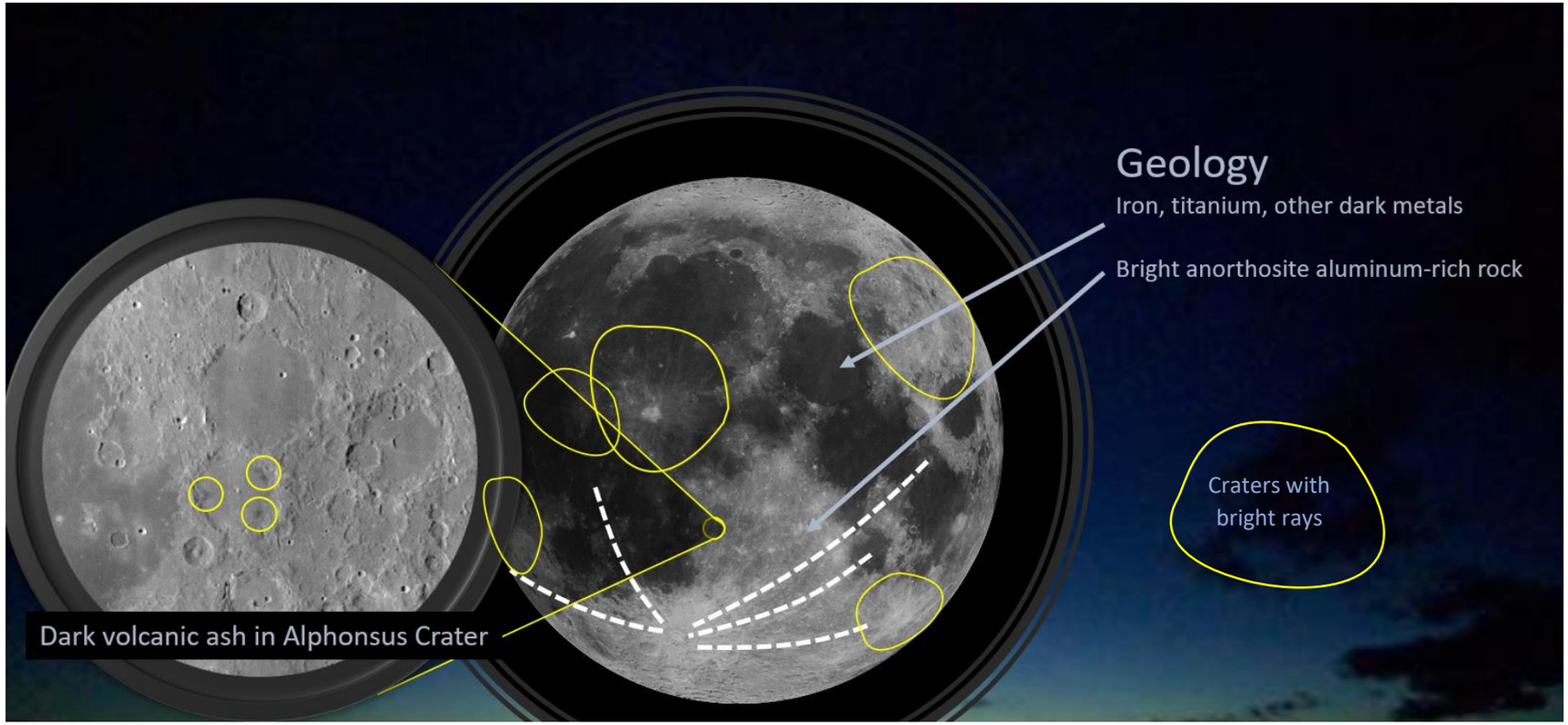
Now its time for Halloween in Space!
And what could be better for Halloween than…

…a Full Moon!!

This Halloween features a full moon,
on a Saturday night,
with kids running around in costumes,
high as kites on sugar!

And then there are the adults!

Scary stuff.



Contrary to popular belief, you *can* observe the Full Moon.

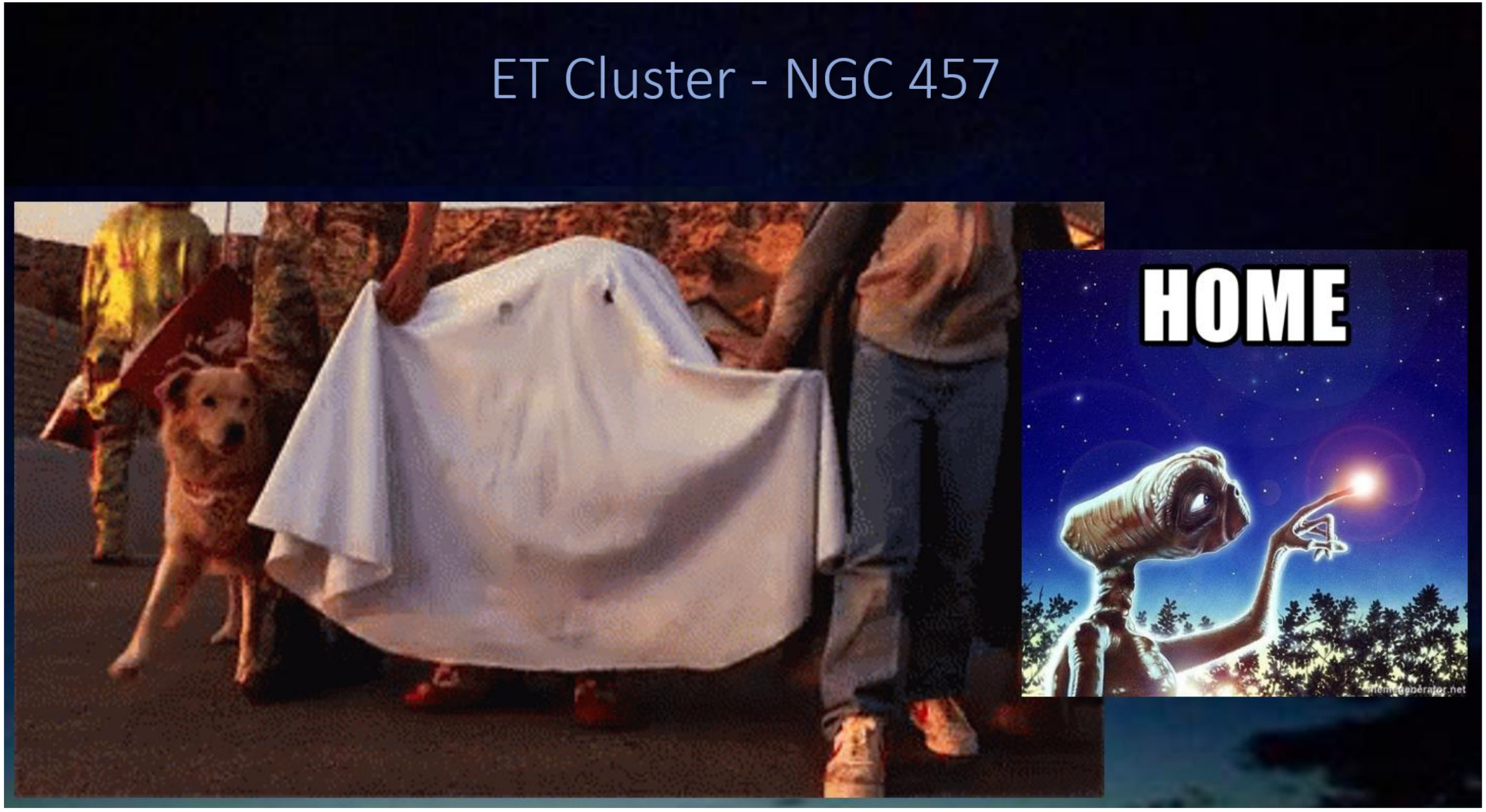
Use a moon filter to cut the brightness down. Most moon filters reduce transmission by 87%, letting only 13% thru, making it easier to observe detail.

You can do geology, looking for the darker areas containing iron, titanium and other dark metals that tend to sink towards the centre of a forming body. Seeing them on the surface helps explain their volcanic journey as they rose up as lava through deep cracks from huge asteroid hits. The brighter highlands to the south are rich in anorthosite rocks containing aluminum.

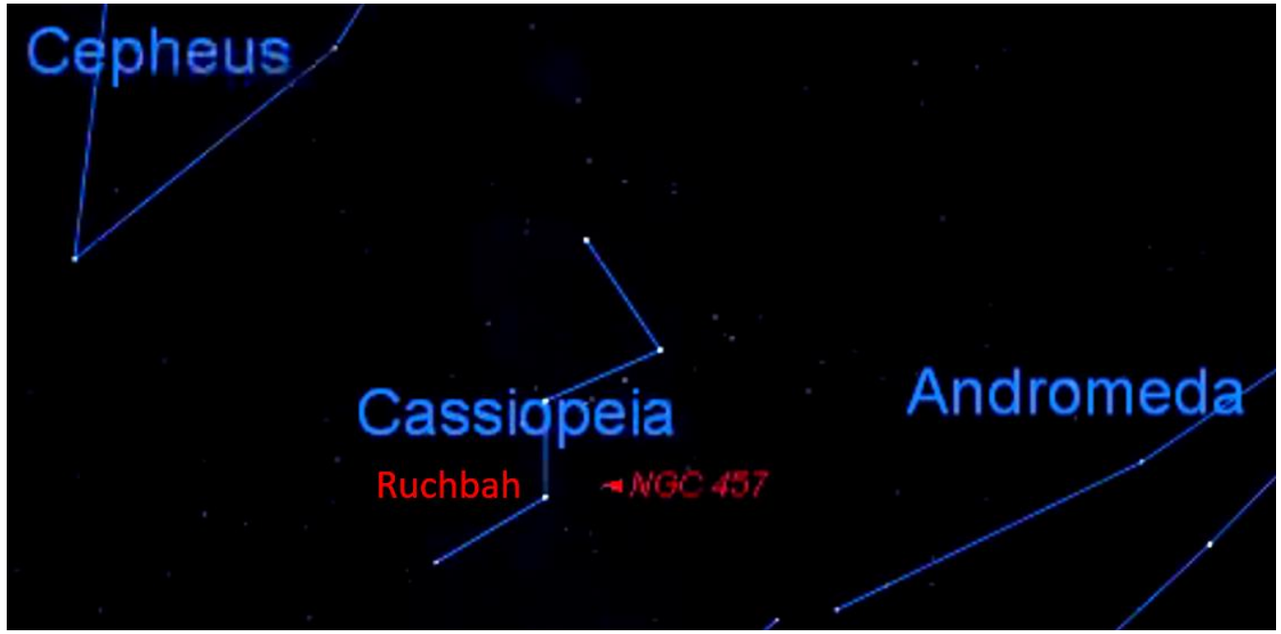
You can find volcanic ash deposits during full moon, such as the three dark patches found on the floor of Alphonsus Crater. Since the Sun is overhead there, there are no shadows, so black patches would be ash, not shadows.

It's easy to trace the bright rays of ejected material stretching up to 1500 km around the globe from Tycho Crater during Full Moon. You can search around the Moon, finding other craters with rays. Cosmic rays, solar storms and pulverization by micro meteorites eventually darken and erase these rays. When we find rays, we know their craters are relatively fresh. Tycho, for example, is only 108 million years old based on rocks from a ray returned by Apollo 17 astronauts.

ET Cluster - NGC 457



Are you old enough to remember ET sneaking out on Halloween in a plot to call home? Well, as you may know, he's found a home in space. We call it NGC 457.



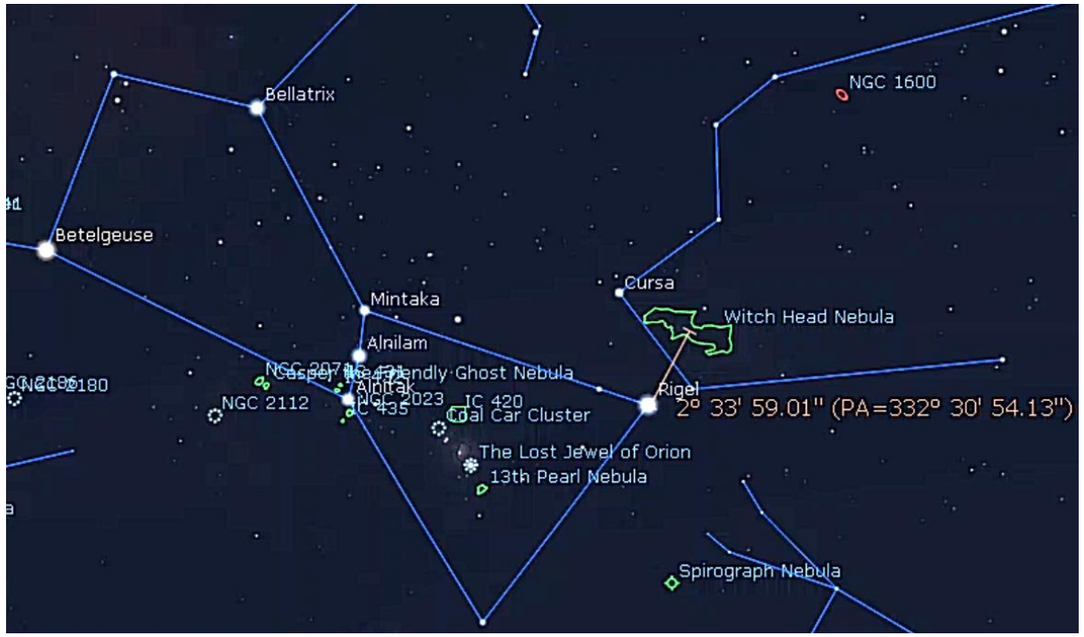
NGC 457 is found just two degrees SSE of Ruchbah, or Delta Cassiopeiae.

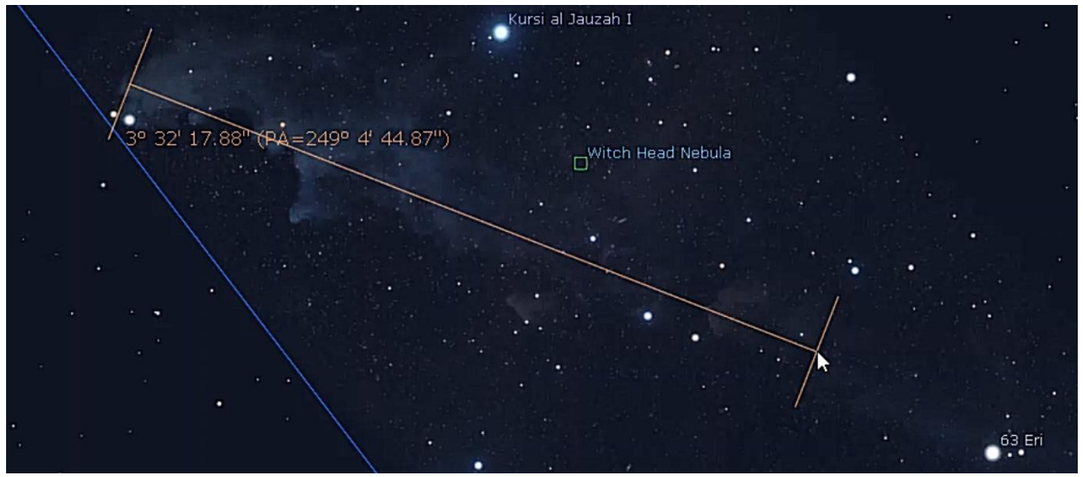
It is a rich cluster with over 150 stars, a noticeable concentration, and a large range of brightness among its member stars.

The cluster is around 7900 light years from us, and is estimated to be 21 million years old. That’s young.

Our final Halloween target is the Witch Nebula, IC 2118, a reflection nebula in the constellation Eridanus, west of Orion. The dust grains of the cloud are illuminated by nearby brilliant Rigel. Rigel shines 120,000 times brighter than our Sun, which is how it is able to illuminate the cloud lying 40 AU away from it. That's 40 times the Earth-Sun distance, or the radius of Pluto's orbit.

Conditions in the nebula are favourable for star formation. Astronomers have detected candidates for pre-main sequence stars, very young stars just beginning their lives, within the Witch's head.





The location of the Witch Head Nebula is easy to find. It's a little over 2.5° WNW of Rigel. It's a large object, measuring 3° to 4° in length, stretching its magnitude of 8 down to a surface brightness of 17.82. That's faint. To visually see it, you need the darkest location you can get to, no Moon and above average transparency.

4 or 5-inch refractors are capable of showing it according to a discussion on the Cloudy Nights forum. One fellow said he saw it in a 101mm Tele Vue refractor with a 35mm Panoptic eyepiece, which would provide 15 times magnification in a 4.4° field of view.

The bigger your telescope's aperture, the better your chances, though bigger scopes tend to have smaller fields of view, so you may need to sweep along the nebula's length to see all of it.

Thank you, and have a happy Halloween.

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