OBSERVING HIGHLIGHTS for December 8 to 22, 2024, a "bright Moon period"
Black Canyon Astronomical Society (BCAS), western Colorado, USA

SUMMARY.

During this bright Moon period, gaze at brilliant Venus in the southwest during and just after evening twilight. On December 8 after 8:30 PM MST, see Mars near the Beehive Star Cluster and then on the night of December 17-18 spot Mars next to the gibbous Moon (use binoculars for great views of these encounters!).

The Moon reaches first quarter on December 8. From December 9 to 13, watch the gibbous Moon wax. The Moon is full on the night of December 14-15 (exactly full at 2:02 AM MST on December 15). From December 16 to 21, the gibbous Moon wanes, and the Moon reaches last quarter on December 22. On the night of December 8, the first quarter Moon is about 10 degrees east of Saturn. On the night of December 13-14, the waxing gibbous Moon is northwest of Jupiter, and on the night of December 14-15, the full Moon is north and east of Jupiter. On the night of December 17-18 between midnight and 2 AM MST, the waning gibbous Moon passes just half a degree north of reddish Mars.

Venus, moving amidst the stars of Capricornus, now sets well after the end of evening twilight. As the sky darkens, Saturn is high in the south in Constellation Aquarius and remains visible until it sets after 10 PM MST. Using binoculars or a telescope in the evening, try to spot Uranus, the Seventh Planet, as it moves among the stars of western Taurus. Bright Jupiter, also in Taurus, is visible nearly all night long. You can see Jupiter's four "Galilean" satellites with binoculars and telescopes. Use a telescope to watch the shadows of these moons cross the Giant Planet on 8 nights. These "shadow transits" are total solar eclipses on Jupiter! We can watch the shadow of Ganymede, the largest moon in the Solar System, cross Jupiter on the evenings of December 8 and 15, and on the night of December 22-23. On December 22-23, between 12:48 and 1:54 AM MST, we can watch the shadows of Ganymede and Io cross the Giant Planet at the same time (a double solar eclipse!). Mars, rising before 8:30 PM MST, is now getting brighter rapidly as Earth gets nearer to the Red Planet. Mercury was in the evening sky until the third week or November, but now the "Speedster Planet" has passed solar conjunction and becomes visible in the predawn sky by December 12. Morning-by-morning, the Innermost Planet will get easier to spot above the east-southeastern horizon at around 6:30 AM MST, as its apparent separation from the Sun increases and it steadily brightens.

As of December 7, there are many active regions with large sunspots on the Earth-facing side of the Sun, and X-class (extreme) flares occurred on October 1, 3, 7, 9, 24 26, 31 and November 6 and 10. Moderate and extreme, solar flares are likely, as are coronal mass ejections of charged particles. You can monitor solar activity safely in real time on the internet. This high solar activity is triggering geomagnetic storms, auroras (aka "northern lights"), and airglow. So, keep watch for these phenomena!

The peak of the Geminid Meteor Shower, the most reliable of annual meteor showers, occurs on the night of December 13-14. But light from the nearly full Moon will "wash out" all but the brightest Geminids.

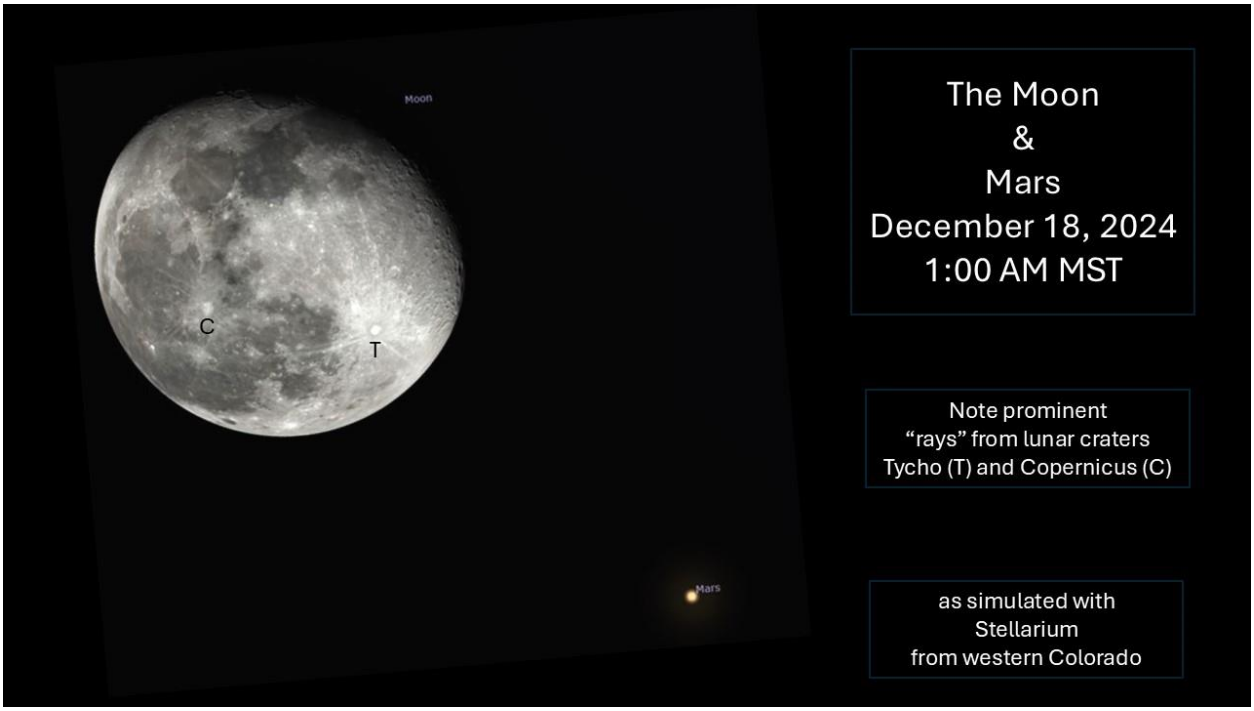
From western Colorado, view passes of interesting satellites, including pre-dawn passes of the bright International Space Station (ISS) on December 12 and from December 14 through 20. There are also pre-dawn passes of Tiangong, the Chinese Space Station, from December 8 through 20.

Large antennas (693 square feet of surface area!) on AST SpaceMobile's first five BlueBird satellites were deployed on October 25. These direct-to-cell communications satellites, orbiting at about 500 km (310 miles) altitude, can be as bright as magnitude +1.35, adding to the visible clutter in our night sky. AST SpaceMobile plans to launch 45 to 60 even larger BlueBird satellites to provide continuous cell phone coverage over the United States.

WESTERN SLOPE SKIES. Since 2011, BCAS and KVNF Community Radio have been producing Western Slope Skies (WSS), a biweekly astronomy feature, which airs every two weeks at about 8:10 AM on Fridays and 7:00 PM on following Wednesdays. On December 6 and 11, park ranger Nick Myers presents "The Big Wow!." Then on December 20 and 25, Art Trevena tells us about "The Winter Sun" 2025 (update)."

Note: The apparent brightness of sky objects is measured in "magnitude" units. Many bright stars are magnitude +1, while the faintest stars easily visible to unaided eyes under dark skies are magnitude +6. Some of the brightest stars are 0 magnitude (e.g., Vega, Arcturus), while the brightest sky objects have negative magnitudes (e.g., Sirius at -1.5, Jupiter at -2 to -3, Venus at -4 to -5, the full Moon at -12 to -13, and the Sun at -26.7 magnitude). Angular distances on the sky are usually cited in degrees of arc. Helpful ways to estimate 1, 5, 10, 15, and 25 degrees of arc can be found here: https://www.timeanddate.com/astronomy/measuring-the-sky-by-hand.html

THE MOON. The Moon reaches **first quarter on December 8** (exactly at 8:26 AM MST). From December 9 to 13, watch the gibbous Moon wax. **The Moon is full on the night of December 14-15** (exactly full at 2:02 AM MST on December 15). From December 16 to 21, we can watch a gibbous Moon wane. The Moon reaches **last quarter on December 22** (exactly at 3:18 PM MST). On the night of December 8, the first quarter Moon is about 10 degrees east of Saturn. On the night of December 13-14, the waxing gibbous Moon is northwest of Jupiter, and on the night of December 14-15, the full Moon is north and east of Jupiter. On the night of December 17-18 between midnight and 2 AM MST, the waning gibbous Moon passes just half a degree north of reddish Mars. We look forward to our next full Moon occulting (moving in front of) Mars on January 13, 2025. NASA has published a stunning visualization of lunar phases for year 2024. Another fun site is NASA's daily Moon guide.



VENUS: AN EVENING BEACON IN THE SOUTHWEST! Even against bright twilight, you can easily spot Venus above the southwestern horizon after sunset. And as the sky darkens, Venus' brilliance becomes

stunning! During this period Venus brightens from magnitude -4.23 to -4.34. "Earth's Sister Planet" now sets well after twilight's end, at about at 8:05 PM MST on December 8 and 8:32 PM MST on December 22. Venus is getting closer to Earth: Our "Sister Planet" is 85 million miles distant on December 8 and 76 million miles distant on December 22. Through telescopes, Venus' gibbous phase wanes from 65% to 59% illuminated, as its apparent diameter increases from 18.2 to 20.5 arc seconds during this period. **Please do your Venus spotting after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.**

SATURN IN THE EVENING SKY. Saturn, moving against the stars of Aquarius, is more than 40 degrees high in the south as the sky darkens. The Ringed Planet sets in the west at about 11:33 PM MST on December 8 and 10:42 PM MST on December 22. Saturn is 898 million miles distant on December 8 and 919 million miles distant on December 22. Saturn fades slightly from magnitude +0.98 to +1.03 during this period. Through telescopes, the Ringed Planet appears 17 arc seconds wide, and its rings span 40 arc seconds. With a telescope or high-magnification binoculars, it's possible to spot Titan, Saturn's largest moon.

Telescopes with apertures 5 inches or larger may reveal several other moons of the Ringed Planet. Saturn's rings now appear nearly "edge-on", so they may seem less impressive in telescopes than they did during the past several years. These thin rings will nearly disappear from our perspective during 2025. Because Saturn's rings now appear less inclined, and dimmer, than in past years, it may be easier to spot some of Saturn's mid-sized moons through telescopes. You can follow the changing positions of Saturn's moons by using various planetarium apps and/or logging onto this site:
https://skyandtelescope.org/observing/interactive-sky-watching-tools/saturns-moons-javascript-utility/
For more info on the appearance of Saturn's rings in 2024 and 2025 and phenomena associated with Saturn's moons, see this article…
https://skyandtelescope.org/astronomy-news/observing-news/see-mutual-events-close-approaches-of-saturns-moons/

FIND URANUS, THE SEVENTH PLANET, IN THE EVENING SKY. Uranus is still observable through most of the night. On December 15 (the middle of this "bright Moon period"), the Seventh Planet is 1.738 billion miles from Earth. Uranus is now moving slowly against the stars of western Taurus, about 8 degrees southwest of the Pleiades Star Cluster (M45). Uranus shines at magnitude +5.66, and you may be able to see it with eyes unaided under dark skies. However, it helps to use binoculars or a telescope to find the "Seventh Planet," especially under bright moonlight. Try using a "Go-To" mount, a planetarium app, or a finder chart, like the one at this link…
https://theskylive.com/uranus-info
If you have a telescope, can you resolve Uranus' 4 arc second-wide disk? Does the Planet look colorful? Through telescopes, most people perceive Uranus as various shades of green or blue.

JUPITER: NEARLY ALL NIGHT LONG. Bright Jupiter was opposite the Sun in our sky on December 7 and the Giant Planet is still visible nearly all night long. Even in bright twilight, Jupiter becomes visible at around 5:15 PM MST about 12 degrees above the east-northeastern horizon. Currently in Constellation Taurus between "the horns of the bull", Jupiter remains visible throughout the night, setting in the west northwest just before sunrise at 7:19 AM MST on December 8 and at 6:16 AM MST on December 22 during nautical twilight. During this period Jupiter shines at magnitude -2.8. Jupiter is 380 million miles distant on December 8 and 384 million miles distant on December 22. Through telescopes or binoculars, the Giant Planet's apparent equatorial diameter is 48 arc seconds.

Use a telescope or binoculars to spot Jupiter's four bright "Galilean" moons. You can identify them by their changing positions and referring to various planetarium apps or this website:

https://skyandtelescope.org/wp-content/plugins/observing-tools/jupiter_moons/jupiter.html
Use a telescope to view shadow transits (total solar eclipses on Jupiter!) by Jupiter's large moons (see details below). **Ganymede, the largest moon in the Solar System, casts the largest shadow of Jupiter's moons, and its shadow is usually the easiest to spot crossing the Giant Planet. From Colorado, there is a transit of Ganymede's shadow in the early evening of December 8 and a "primetime" transit of Ganymede's shadow on the evening of December 15 (details below). <u>And on the night of December 22-23, between 12:48 AM and 1:54 AM MST, we can see the shadows of both Ganymede and Io projected onto Jupiter (try viewing around 1:10 AM MST)!</u>** Io's shadow is larger than Europa's but smaller than Ganymede's shadow. Callisto's shadow does not cross Jupiter during this period.

December 8, 2024, 3:30 PM to 5:50 PM MST. Ganymede's shadow crosses Jupiter at a very high southern latitude on Jupiter. Occurring just one day after Jupiter's opposition to the Sun, the shadow of Ganymede is directly adjacent to the moon itself – likely an interesting sight! (Locally, this event begins in daylight at 3:30 PM MST, before Jupiter rises at 4:39 PM MST, and it ends in late twilight when Jupiter is 12 degrees above the east-northeastern horizon).

December 8, 2024, 8:58 PM to 11:10 PM MST, Io's shadow crosses Jupiter.

December 10, 2024, 3:28 PM to 5:40 PM MST, Io's shadow crosses Jupiter (Locally, this event begins in daylight before Jupiter rises at 4:29 PM MST and the sun sets at 4:49 PM MST, and it ends with Jupiter 12 degrees high in the east-northeast).

December 12-13, 2024, 10:48 PM to 1:20 AM MST, Europa's shadow crosses Jupiter.

December 14, 2024, 4:24 AM to 6:36 AM MST, Io's shadow crosses Jupiter (Locally, this event begins with Jupiter 27 degrees high in the west and ends with Jupiter only 3 degrees above the west-northwestern horizon).

December 15, 2024, 7:30 PM to 9:52 PM MST. Ganymede's shadow crosses Jupiter at a very high southern latitude on Jupiter.

December 15-16, 2024, 10:54 PM to 1:06 AM MST, Io's shadow crosses Jupiter.

December 17, 2024, 5:22 PM to 7:34 PM MST, Io's shadow crosses Jupiter (Locally, this event begins in bright twilight with Jupiter 14 degrees above the east-northeastern horizon, and it ends with Jupiter 40 degrees above the horizon).

December 20, 2024, 1:24 AM to 3:56 AM MST, Europa's shadow crosses Jupiter.

<u>On the night of December 22-23, from 12:48 AM to 1:54 AM MST, we can see the shadows of both Ganymede and Io projected onto Jupiter (a double solar eclipse!). A great time to view would be around 1:10 AM MST on December 23 (more info below):</u>

December 22-23, 2024, 11:30 PM to 1:54 AM MST, Ganymede's shadow crosses Jupiter at a very high southern latitude on Jupiter.

December 23, 2024, 12:48 AM to 3:00 AM MST, Io's shadow crosses Jupiter

MARS RISES BEFORE 8:30 PM MST – GETTING CLOSER AND BRIGHTER! Reddish Mars rises in the east northeast at 8:18 PM MST on December 8 and at 7:12 PM MST on December 22. Mars is prominent in the eastern sky from just after it rises until morning twilight starts interfering. Between December 8 and 22, the Red Planet brightens markedly from magnitude -0.68 to -1.03, as its distance from Earth decreases from 70 million to only 64 million miles. On December 8, Mars is about 2 degrees north of the "Beehive" Star Cluster (aka M44) in Constellation Cancer (a nice view in binoculars!). Mars is now "retrograding" (moving westward) against the stars of Cancer and will reenter Constellation Gemini on January 12. Compare reddish Mars to the red supergiant star, Betelgeuse, and the red giant star, Aldebaran. Mars now appears much brighter than these stars, and Mars twinkles less (or likely, not all). Through telescopes, Mars appears 12.4 to 13.7 arc seconds wide. Earth is getting closer to Mars, leading up to Mars' opposition from the Sun on January 16. From now through the winter, prominent surface features on Mars may be visible in small telescopes. You can identify various Martian surface features (for example, Syrtis Major, Mare Acidalium, and the North Polar Hood/Ice Cap) for any date and time by using an interactive chart at the following link…
https://skyandtelescope.org/wp-content/plugins/observing-tools/mars_profiler/mars.html
Find more info on observing Mars here:
https://www.alpo-astronomy.org/mars/

MERCURY RACES INTO THE MORNING SKY. On November 22, we could see Mercury shining just above the west-southwestern horizon in evening twilight. Then the Innermost Planet quickly disappeared into the Sun's glare, as it raced toward a solar conjunction on December 5, passing just 63 million miles sunward from Earth. But the "Speedster Planet" is not hidden in the solar glare for long! By December 12 at around 6:30 AM MST, it may be possible to spot Mercury (at magnitude +1.15) in morning twilight 3 degrees above an unobstructed, east-southeastern horizon (with the Sun still 10 degrees below that horizon). Binoculars may help you find the Innermost Planet on the morning of December 12. Mercury gets easier to spot morning-by-morning, as its angular distance from the Sun increases, and it brightens from magnitude +1.15 on December 12 to magnitude -0.24 on December 22. Through telescopes Mercury's phase waxes from a 17%-illuminated crescent on December 12 to a 56%-illuminated gibbous disk on December 22. Mercury's apparent diameter decreases from 9.1 arc seconds on December 12 to 7.0 arc seconds on December 22, as its distance from Earth increases from 69 million to 89 million miles. By December 21 or 22, you may be able to spot the red supergiant star, Antares about 8 degrees below and to the right of Mercury. Mercury will be easier to spot than Antares, because it's higher in the sky and brighter (Mercury at -0.2 magnitude Vs Antares at +1.0 magnitude). **Please do your Mercury and Antares spotting before sunrise. NEVER chance looking at the Sun directly; serious eye damage can result.**

DON'T GIVE UP - KEEP WATCHING THE NORTHERN CROWN! Better late than never? Will there soon be a bright "new" star in Constellation Corona Borealis ("The Northern Crown"), at least briefly? During late November and early December, you can find Corona Borealis low in the west-northwestern sky as evening twilight fades and low in the east-northeastern sky just before morning twilight. T Coronae Borealis (T CrB) is a recurrent nova that (based on its past behavior) may rapidly increase in brightness 1500-fold (to second magnitude) to become the brightest star (or 2nd brightest star) in Corona Borealis between now and sometime in 2025. Then this "new star" may fade rapidly below naked-eye visibility in about a week. As of early on December 7, T CrB had not yet exploded. For more about T CrB, read the article, "Get Ready for a Nova's Bright Return", by astrophysicist Brad Schaefer in the March 2024 issue of Sky & Telescopes Magazine, p. 34-40. You can find additional info at these sites…
https://blogs.nasa.gov/Watch_the_Skies/2024/02/27/view-nova-explosion-new-star-in-northern-crown/

https://skyandtelescope.org/astronomy-news/is-the-blaze-star-about-to-blow-you-may-be-the-first-to-know/
https://en.wikipedia.org/wiki/T_Coronae_Borealis
https://ui.adsabs.harvard.edu/abs/2023ATel16107....1S/abstract
https://www.aanda.org/articles/aa/full_html/2023/12/aa48372-23/aa48372-23.html

THE SUN. The Sun has been very active over the past year, and intensely so in the past several months, when solar active regions have unleashed numerous flares and coronal mass ejections (CMEs) of charged particles. There have been M-class (moderate) solar flares each week for the past year, and there have been many X-class (extreme) solar flares, including X-class flares on July 14, 16, and 29, August 5, 8, and 14, September 12 and 14, and October 1, 3, 7, 9, 24, 26, 31, and November 6 and 10. There also have been CMEs that have triggered geomagnetic storms that caused auroras. Many folks in Colorado and elsewhere viewed and/or photographed striking auroras during the nights of May 10-11 and October 10-11. As of December 7, there are many active regions with sunspots on the Earth-facing side of the Sun. So, we may experience more M- and possibly even X-class flares and powerful CMEs. Airglow and "SARs" also result from high solar activity, and these phenomena also have been photographed and/or observed from Colorado. You can monitor sunspots, solar flares, CMEs, and other solar activity safely and in "real time" at the following sites:
https://sdo.gsfc.nasa.gov/data/
https://stereo.gsfc.nasa.gov/beacon/
http://halpha.nso.edu/
https://www.swpc.noaa.gov/
https://sohowww.nascom.nasa.gov/data/realtime-images.html
http://www.sidc.be/silso/ssngraphics
Note: As of December 7, many real-time images from SDO and SOHO sites are unavailable, due to a technical problem at Stanford. Do not look at the Sun directly without safe, specialized solar filters. Looking at the Sun can be very dangerous unless you take adequate precautions. Severe eye damage and even blindness can result.

AURORAS (aka "polar lights" or "northern lights"). It can be challenging to spot auroras from Colorado's mid-northern latitudes. But on the nights of May 10-11 and October 10-11, many of us were able to see and/or photograph some amazing auroras from Colorado! Coronal mass ejections (CMEs) from the Sun were aimed at our planet. Charged particles from CMEs were captured by Earth's magnetic field, energizing the ionosphere, thereby triggering geomagnetic storms and widespread auroras. As of December 7, there are many active regions with sunspots on the Earth-facing side of the Sun. So, the chances for geomagnetic storms are good and spotting auroras may be possible. You can get predictions and updates for auroras, their intensity, and geographic extent from NOAA's Space Weather Prediction Center:
https://www.swpc.noaa.gov/products/aurora-viewline-tonight-and-tomorrow-night-experimental
Auroras are most frequently seen from high latitudes, e.g., from Canada, Alaska, Iceland, northernmost Europe, southern New Zealand and Antarctica. We can watch auroras in real-time from Yellowknife, Northwest Territories on an all-sky camera at the Canadian Space Agency's AuroraMax website. Like Colorado, Yellowknife is in the Mountain Time Zone. An aurora webcam at the University of Alaska-Fairbanks is two hours behind the Mountain Time Zone…
https://www.youtube.com/watch?v=O52zDyxg5QI

EARTH SATELLITE HIGHLIGHTS. The following predictions are for western Colorado, specifically Montrose, in Mountain Standard Time (MST). Numerous Earth satellites are visible every clear night.

Brighter satellites have smaller magnitude numbers, and the brightest (e.g., the International and Tiangong Space Stations) may have negative magnitudes. These predictions are for selected passes of some bright and/or interesting satellites (as summarized from heavens-above.com). Satellite orbits can change. <u>These predictions for satellite passes may be inaccurate. This is especially true for the International Space Station (ISS) and the Chinese Space Station, Tiangong, and we no longer show ISS and Tiangong predictions more than 5 days beyond the distribution date of the current "BCAS Observing Highlights" edition. Orbits of both space stations change frequently, due to periodic re-boosting and avoidance maneuvers (to prevent collisions with other orbiting objects).</u> For accurate predictions of the ISS and Tiangong beyond December 12, check heavens-above.com or other satellite prediction sites for updates on the nights you wish to observe. Be sure to set application(s) for your location and time zone.

December 8, 2024. Tiangong (Chinese Space Station). 6:14 to 6:16 to 6:19 AM MST. W to NNW to ENE. Appears from Earth's shadow 18 deg above W, max altitude 71 deg above NNW, max magnitude -2.2 (Passing through Gemini, Ursa Major-Big Dipper, and Draco/Hercules). **Predictions for Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

December 9, 2024. Tiangong (Chinese Space Station). 5:19 to 5:21 AM MST. E to ENE. Appears from Earth's shadow at max altitude 43 deg above E, max magnitude -1.0 (Passing through Boötes, Corona Borealis, and Hercules). **Predictions for Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

December 10, 2024. Tiangong (Chinese Space Station). 5:55 to 5:56 to 6:00 AM MST. WNW to N to ENE. Appears from Earth's shadow 40 deg above WNW, max altitude 53 deg above N, max magnitude -1.9 (Passing through Camelopardalis, Ursa Minor, Draco, and Hercules). **Predictions for Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

December 11, 2024. Tiangong (Chinese Space Station). 6:32 to 6:35 to 6:38 AM MST. WNW to N to E. Appears from Earth's shadow 13 deg above WNW, max altitude 46 deg above N, max magnitude -1.6 (Passing through Auriga, Camelopardalis, Ursa Minor, Draco, and Hercules). **Predictions for Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

December 12, 2024. Tiangong (Chinese Space Station). 5:36 to 5:39 AM MST. NNE to ENE. Appears from Earth's shadow at max altitude 44 deg above NNE, max magnitude -1.5 (Passing through Ursa Minor, Draco, and Hercules). **Predictions for Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

December 12, 2024. International Space Station (ISS). 6:08 to 6:10 to 6:12 AM MST. SSE to SE to E. Max altitude 14 deg above SE, max magnitude -0.5 (Passing through Centaurus, Hydra, Libra, and Ophiuchus). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

As of December 7, additional pre-dawn passes for the ISS are predicted for December 14 to 20. And additional pre-dawn passes of Tiangong are predicted for December 13 to 20. These predictions are subject to change due to orbital adjustments. For updates on times, check heavens-above (or other prediction websites) shortly before you want to observe. Be sure to enter your location and time zone info when using prediction websites.

UPDATE ON BLUEBIRD SATELLITES

AST SpaceMobile's BlueBird satellites deployed their large antennas (693 square feet of surface area!) on October 25, 2024. The good news is that AST SpaceMobile's BlueBird satellites may enable continuous mobile phone coverage over the entire U. S. (with no dead zones) for AT&T and Verizon customers. The bad news is that these satellites are huge and relatively bright, adding to visible clutter in our night sky. In the next two years, AST SpaceMobile plans to launch 45 to 60 even larger BlueBird satellites. Currently, there's little public information on the brightness of the first 5 BlueBird satellites. Recently, I viewed some pre-dawn BlueBird passes from near Cedaredge Colorado and estimated their maximum brightnesses. Here are my estimates:

Nov. 14 BlueBird SM002, +3 max magnitude estimated, 71 deg max alt.
Nov. 14 BlueBird SM001, + 4 max magnitude estimated, 50 deg max alt.
Dec. 1 BlueBird SM001, +2.7 max magnitude estimated, 51 deg max alt.
Dec. 1 BlueBird SM005, + 2.0 max magnitude estimated, 56 deg max alt.
Dec. 2 BlueBird SM001, +2.7 max magnitude estimated, 55 deg max alt.
Dec. 2 BlueBird SM005, +2.0 max magnitude estimated, 61 deg max alt.
Dec. 2 BlueBird SM003, +1.35 max magnitude estimated (as bright as Regulus), 88 deg max alt.

Based on FCC document DA 24-756, "AST must make a good faith effort to demonstrate an optical brightness with an initial aim of 6th magnitude and progress toward 7th magnitude or fainter…" From the above estimates, BlueBird satellites were about 6 to 70 times brighter than the FCC's magnitude +6 target. While not the brightest satellites in the sky, BlueBirds are obvious to unaided eyes and will be recorded on many wide-field nightscape photos. As of December 7, BlueBird satellite passes are not hot-linked on the heavens-above home page, although AST's prototype satellite, Bluewalker 3, is listed. I will not regularly be listing BlueBird passes in "BCAS Observing Highlights." But, if you want to monitor their brightness, you can find BlueBird pass info through the following procedure: Go to the heavens-above.com home page, select "satellite database", enter the BlueBird "Sat. ID No." (see table, below), select "update," then select satellite "Name", and "passes." Be sure to enter your location and time zone.

BlueBird No.	Sat. ID No.
SM003	61045
SM005	61046
SM001	61047
SM002	61048
SM004	61049

HAPPY OBSERVING!