OBSERVING HIGHLIGHTS for January 21 to February 5, 2025, a "dark Moon period"
Black Canyon Astronomical Society (BCAS), western Colorado, USA

SUMMARY. This is a great time to enjoy four bright planets and the striking constellations and stars of winter! As evening twilight fades, Saturn is low in the west southwest with brilliant Venus above it, bright Jupiter is high in the south, and reddish (or butterscotch-tinted?) Mars is high in the east. With a bright Moon absent from the early evening sky before January 31, it may be possible to see shadows cast by brilliant Venus from dark locations after the end of twilight! To see a Venus-cast shadow, try placing a small object directly in front of a white surface, aligned toward Venus. Constellation Orion, with its bright stars, blue-white Rigel and reddish Betelgeuse, and several second-magnitude stars, is high in the south. Constellation Auriga with the bright star, Capella, is nearly overhead, and Constellation Gemini, with first-magnitude Pollux, second-magnitude Castor, and that bright interloper, Mars, is high in the east. Sirius, the sky's brightest star, is rising higher in our southeastern evening sky. The winter Milky Way extends from the northwestern horizon, through Constellation Auriga near the zenith, to the southeastern horizon.

If you have a telescope, watch the shadow of Ganymede, the largest moon in the Solar System, move across the face of Jupiter on January 27 during "primetime" from 7:30 PM to 10:04 PM MST. There's another transit of Ganymede's shadow on the night of February 3-4 between 11:30 PM to 2:06 AM MST.

The Moon reaches last quarter on January 21, and from January 22 to 27, we can watch a crescent Moon wane in the morning sky. The Moon is new, and consequently invisible, on January 29. Watch the crescent Moon wax during evenings from January 30 to February 4. The Moon reaches first quarter on February 5. On January 24 between 4:30 AM and 6:30 AM MST, look for a 25%-illuminated, waning crescent Moon just east of the reddish star, Antares. On January 31 between 6:30 PM and 7:45 PM MST, look for a thin (8%-illuminated), waxing crescent Moon about 3 degrees below Saturn. On the evening of February 1, the 15%-illuminated, crescent Moon is about 3 degrees left of brilliant Venus – a striking sight in binoculars! Enjoy seeing earthshine faintly illuminate the nightside of the crescent Moon, especially on mornings from January 24 to 27, and on evenings from January 30 to February 2 (binoculars can provide eye-catching views!).

As of January 20, there are many active regions with large sunspot on the Earth-facing side of the Sun. X-class (extreme) solar flares occurred on December 30, and on January 3 and 4. Moderate and even 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!

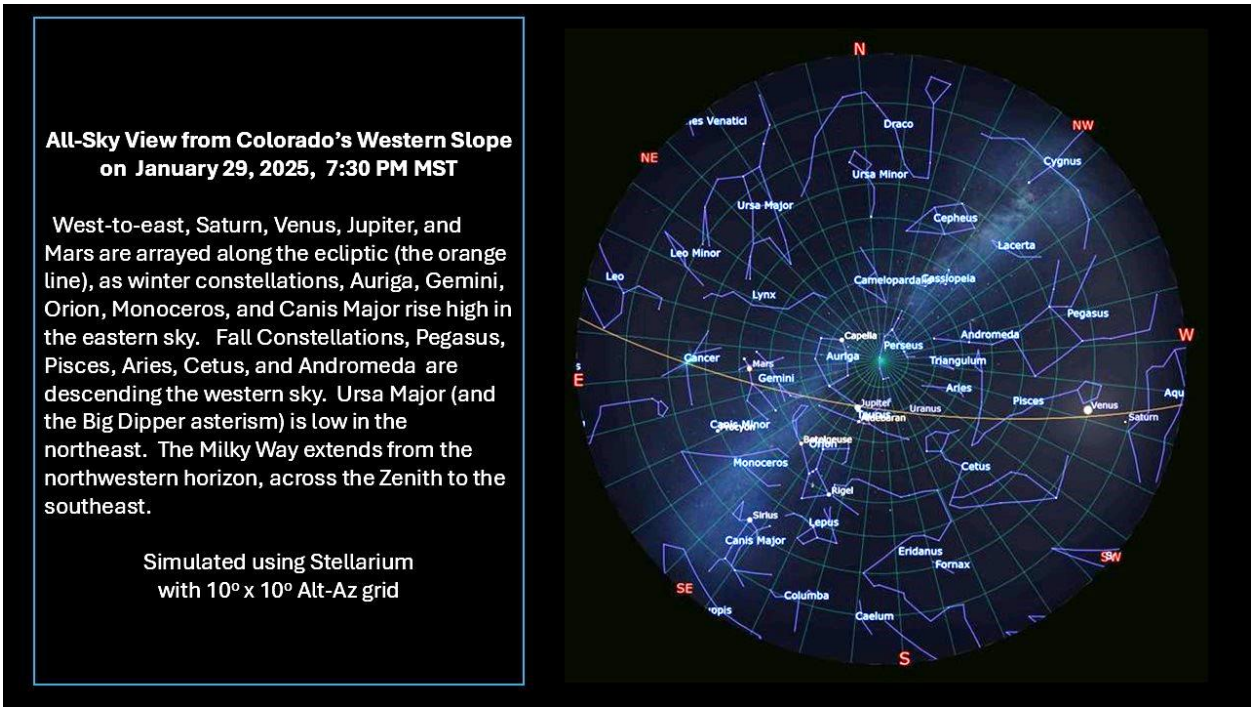
From western Colorado, view passes of interesting satellites, including evening passes of the bright International Space Station (ISS) from January 24 to February 3 and predawn passes of the almost-as-bright Tiangong (Chinese) Space Station from January 24 to February 5. And there are evening passes of NASA's Advanced Composite Solar Sail System (ACS3) between January 20 and February 4. ACS3 has been tumbling. This results in large changes in brightness over a period of about 6 seconds (from as bright as magnitude +1 to fainter than magnitude +5), as this satellite crosses the sky.

WESTERN SLOPE SKIES. Since 2011, KVNF Community Radio has produced Western Slope Skies (WSS), a biweekly astronomy feature, which has aired every two weeks on Friday mornings and on following Wednesday evenings. On January 17 and 22, Dr. Bob Grossman tells us about the Western Slope Dark Sky Coalition. Then on January 31 and February 5, Dr. Catherine Whiting, Assistant Professor of Physics and Astronomy at Colorado Mesa University (CMU), will discuss "The Fermi Paradox." For 2025, WSS

features on KVNF are being coordinated by Dr. Catherine Whiting, with contributions from CMU, the Western Colorado Dark Sky Coalition, and the Black Canyon Astronomical Society.

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

A DARK WINTER SKY WITH FOUR BRIGHT PLANETS! On clear moonless evenings, step outside just after twilight ends and enjoy viewing 4 bright planets and the striking stars of winter! Use a planetarium app or the chart below to help navigate. Saturn is low in the west southwest with brilliant Venus above it, bright Jupiter is high in the south, and reddish Mars is high in the east. The planets are arrayed along the ecliptic (the orange line on the chart below), which is the path the Sun appears to travel through our sky, as we orbit our central star. The orbits of these 4 planets are inclined by less than 4 degrees to Earth's orbit, so they always appear near the ecliptic. Constellation Orion, with bright Rigel and reddish Betelgeuse, is high in the south. Constellation Auriga with bright Capella is nearly overhead, and Constellation Gemini, with first-magnitude Pollux, second-magnitude Castor, and that bright, reddish, interloper, Mars, is high in the east. Sirius, the sky's brightest star, is rising higher in the southeast, and the Big Dipper (part of Constellation Ursa Major) is low in the northeast. The star clouds of the winter Milky Way extend from Constellation Cygnus near the northwestern horizon, through Auriga near the zenith, to Puppis, at the southeastern horizon.



THE MOON. The moon reaches **last quarter on January 21** (exactly at 1:31 PM MST), and from January 22 to 27, we can watch a crescent Moon wane in the morning sky. The **Moon is new, and consequently**

invisible, on January 29 (exactly new at 5:36 AM MST). Watch the crescent Moon wax during evenings from January 20 to February 4. The **Moon reaches first quarter on February 5** (exactly at 1:02 AM MST). On January 24 at between 4:30 AM and 6:30 AM MST, look for a 25%-illuminated, waning crescent Moon just east of the reddish star, Antares. On January 31 between 6:30 PM and 7:45 PM MST, look for a thin (8%-illuminated), waxing crescent Moon about 3 degrees below Saturn. On the evening of February 1, the 15%-illuminated, crescent Moon is about 3 degrees left of Venus – a striking sight in binoculars! Enjoy seeing earthshine faintly illuminate the nightside of the crescent Moon, especially on mornings from January 24 to 27, and on evenings from January 30 to February 2 (binoculars can provide eye-catching views!). NASA has published a stunning visualization of lunar phases for year 2025. Another fun site is NASA's daily Moon guide. **Please do your crescent Moon spotting before sunrise and after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.**

VENUS: BRIGHTER YET IN THE EARLY EVENING! Wow! As the sky darkens, Venus, high above the west-southwestern horizon, is brilliant, and getting a bit brighter night-by-night! On January 20 and 23, Venus still appears within 5 degrees of Saturn, but during evenings thereafter, Saturn sinks toward the western horizon, as Venus maintains its high altitude in our early evening sky. During this period Venus brightens from magnitude -4.65 to -4.80. Venus is predicted to be brightest between February 15 and 23. **With the Moon absent from the early evening sky (before January 31), it may be possible to see shadows cast by Venus from dark locations after the end of twilight! To see a Venus-cast shadow, try placing a small object directly in front of a white surface, aligned toward Venus**. "Earth's Sister Planet" now sets well after twilight's end, at about 9:14 PM MST on January 21 and 9:19 PM MST on February 5. Venus was at its greatest angular separation east of the Sun on January 10. Venus is moving mostly northward during this period, which causes our "Sister Planet" to set later, as seen from the northern hemisphere. Venus continues to get closer to Earth: Our "Sister Planet" is 55 million miles distant on January 21 and 45 million miles distant on February 5. Through telescopes, Venus' crescent phase wanes from 44% illuminated on January 21 to 34% illuminated on February 5, as Venus' apparent diameter increases from 28.1 to 34.3 arc seconds. **Please do your Venus spotting after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.**

SATURN IN THE EARLY EVENING. Saturn is less than 30 degrees above the southwestern horizon as the sky darkens. The Ringed Planet sets in the west at about 8:57 PM MST on January 21 and 8:06 PM MST on February 5. **Between January 20 and 23, Saturn appears within 5 degrees of brilliant Venus.** Thereafter night-by night, Saturn continues to sink toward the west, as Venus maintains its altitude. Although Saturn and Venus appear close in the sky from our earthly perspective from January 20 to 23, Saturn is about 17 times more distant than Venus. Saturn is 958 million miles distant on January 21 and 972 million miles distant on February 5. Saturn shines at magnitude +1.1 during this period. Through telescopes, the Ringed Planet appears 16 arc seconds wide, and its rings span 37 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/

Please do your Saturn spotting after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.

JUPITER IN THE EVENING SKY. As twilight fades, bright Jupiter stands more than 50 degrees above the southeastern horizon, reaching an altitude of more than 70 degrees above the southern horizon between 8 and 9 PM MST. Jupiter is currently moving against the stars of Constellation Taurus, about 5 degrees north from the red giant star, Aldebaran and the Hyades Star Cluster. The Giant Planet sets in the west northwest at about 4:05 AM MST on January 21 and 3:05 AM MST on February 5. During this period Jupiter fades slightly from magnitude -2.60 to -2.48. Jupiter is 409 million miles distant on January 21 and 428 million miles distant on February 5. Through telescopes or binoculars, the Giant Planet's apparent equatorial diameter is 44 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. **There is a "primetime" transit of Ganymede's shadow on January 27 from 7:30 PM to 10:04 PM MST and another one late on the night of February 3-4.** Io's shadow is larger than Europa's, but smaller than Ganymede's shadow. Callisto's shadow does not cross Jupiter during this period.

January 21, 2025, 1:04 AM to 3:40 AM MST, Europa's shadow crosses Jupiter (Locally this event begins with Jupiter 33 degrees high in the western sky and ends with Jupiter only 4 degrees above the west-northwestern horizon.

January 22, 2025, 2:58 AM to 5:12 AM MST, Io's shadow crosses Jupiter (Locally this event begins with Jupiter only 11 degrees above the west-northwestern horizon and ends long after Jupiter sets at 4:02 AM MST).

January 23, 2025, 9:28 PM to 11:42 PM MST, Io's shadow crosses Jupiter.

January 25, 2025, 3:56 PM to 6:10 PM MST, Io's shadow crosses Jupiter (Locally, this event begins in daylight with Jupiter 30 degrees above the eastern horizon and ends in nautical twilight with the Sun 10 degrees below the horizon).

January 27, 2025, 7:30 PM to 10:04 PM MST, Ganymede's shadow crosses Jupiter at high southern latitude on Jupiter.

January 30-31, 2025, 11:22 PM to 1:38 AM MST, Io's shadow crosses Jupiter.

January 31, 2025, 4:56 PM to 7:34 PM MST, Europa's shadow crosses Jupiter (Locally, this event begins in daylight with Jupiter 46 degrees above the eastern horizon and ends with Jupiter high in a dark sky).

February 1, 2025, 5:52 PM to 8:06 PM MST, Io's shadow crosses Jupiter (Locally this event begins in bright twilight with the Sun only 4 degrees below the horizon and ends with Jupiter 73 degrees high in the sky, well after twilight has ended).

February 3-4, 2025, 11:30 PM to 2:06 AM PM MST, Ganymede's shadow crosses Jupiter at high southern latitude on Jupiter (Locally, this event begins with Jupiter 40 degrees above the western horizon and ends with Jupiter 11 degrees above the west-northwestern horizon).

MARS – NEARLY ALL NIGHT LONG. Reddish (or butterscotch-tinted?) Mars is well above the east-northeastern horizon as the sky darkens. Mars sets in the west northwest in bright twilight at 7:28 AM MST on January 21 and in dimmer, astronomical twilight at 6:07 AM MST on February 5 (with the Sun still 13 degrees below the horizon). From January 20 to 23, Mars is about 3 degrees from Pollux, the brightest star in Constellation Gemini. Mars outshines Pollux by a factor of 10. How do you perceive the colors of Mars and Pollux (to enhance color, try viewing with binoculars)? Pollux is a red giant star that many people perceive as orange or yellow, while perceptions of Mars vary from reddish, to orange, to "butterscotch." After Earth's close approach to Mars on January 12, the Red Planet is fading from magnitude -1.3 on January 21 to magnitude -1.0 on February 5, as its distance from Earth increases from 60.7 million miles to 65.7 million miles. Mars rises more than 70 degrees high in Colorado's skies between 10 PM and midnight. Through telescopes Mars' apparent diameter decreases from 14.35 to 13.22 arc seconds during this period, but that's still large enough for spotting interesting features on the Red Planet. When Mars rises this high in our sky, we see it through a relatively thin cross section of Earth's turbulent atmosphere, which may allow for good views of Martian surface features such as Syrtis Major, Mare Acidalium, and the north polar ice cap and/or clouds of the "north polar hood." You can identify Martian surface features for any date and time by using the 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/jbeish/2025_MARS.htm

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 this period, you can find Corona Borealis in high in the eastern sky 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 or 2026. Then this "new star" may fade rapidly below naked-eye visibility in about a week. As of early on January 20, 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 November 6 and 10, December 8 and 30, and January 3 and 4. 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 January 20, there are many active regions with sunspots on the Earth-facing side of the Sun, and an X-class flare occurred as recently as January 4. So, we may experience more M- and possibly X-class flares and powerful CMEs. Airglow and SAR arcs 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: Near-real-time images from SDO and SOHO sites are again available, after more than 40 days of down time caused by damage from a water main burst at Stanford University. 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 January 20, 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. 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. These predictions 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). For accurate predictions of the ISS, Tiangong, and other satellites beyond January 24, 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. On April 23, 2024, Rocket Lab launched a NASA satellite called the Advanced Solar Sail System (ACS3) to test propulsion from the

solar wind. There are optimal passes of ACS3 over the Western Slope during the next two weeks. The Advanced Composite Solar Sail System (ACS3) has been tumbling, resulting in big variations in its brightness. I observed ACS3 pass high in the sky on the evenings of December 24, 31, January 2, 17, and 18, when it varied from as bright as magnitude +1 to fainter than +5 over a period of about 6 seconds.

January 20, 2025. Advanced Composite Solar Sail System (ACS3), 7:06 to 7:12 to 7:19 PM MST. S to W to NNW. Max altitude 62 deg above W, max magnitude +2.4 (Passing through Eridanus, Fornax, Cetus, Pisces, Andromeda, Cassiopeia/Lacerta, Cepheus, and Draco). **Brightness may vary hugely over a period of several seconds due to tumbling. Predictions for ACS3 are subject to change due to orbital changes from the solar wind. Also, NASA plans to control attitude and halt tumbling, which would impact its brightness. Check for updated predictions.**

January 22, 2025. Advanced Composite Solar Sail System (ACS3), 6:16 to 6:22 to 6:28 PM MST. SSE to ENE to N. Max altitude 56 deg above ENE, max magnitude +2.0 (Passing through Eridanus, Orion, Taurus, Auriga, Camelopardalis, and Draco). **Brightness may vary hugely over a period of several seconds due to tumbling. Predictions for ACS3 are subject to change due to orbital changes from the solar wind. Also, NASA plans to control attitude and halt tumbling, which would impact its brightness. Check for updated predictions.**

January 23, 2025. Advanced Composite Solar Sail System (ACS3), 6:42 to 6:48 to 6:55 PM MST. SSE to E to NNW. Max altitude 89 deg above E, max magnitude +1.9 (Passing through Eridanus, Taurus/Cetus, Perseus/Andromeda, Cassiopeia, Cepheus, and Draco). **Brightness may vary hugely over a period of several seconds due to tumbling. Predictions for ACS3 are subject to change due to orbital changes from the solar wind. Also, NASA plans to control attitude and halt tumbling, which would impact its brightness. Check for updated predictions.**

January 24, 2025. Tiangong (Chinese Space Station). 6:04 to 6:06 to 6:08 AM MST. SSW to SSE to E. Max altitude 18 deg above SSE, max magnitude +0.6 (Passing through Centaurus, Scorpius, Ophiuchus, Scutum, and Aquila). **Predictions for Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

January 24, 2025. International Space Station (ISS). 6:34 to 6:35 PM MST. N to NNE. Maximum altitude 11 deg above NNE, disappears into Earth's shadow 10 deg above NNE, max magnitude -1.3 (Passing through Draco and Ursa Major). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

January 24, 2025. Advanced Composite Solar Sail System (ACS3), 7:08 to 7:15 to 7:21 PM MST. S to W to NNW. Max altitude 56 deg above W, max magnitude +2.6 (Passing through Eridanus, Fornax, Cetus, Pisces, Andromeda, Lacerta, Cepheus, and Draco). **Brightness may vary hugely over a period of several seconds due to tumbling. Predictions for ACS3 are subject to change due to orbital changes from the solar wind. Also, NASA plans to control attitude and halt tumbling, which would impact its brightness. Check for updated predictions.**

As of January 20, additional evening passes for the ISS are predicted from January 25 to February 3, and additional predawn passes for Tiangong are predicted from January 25 to February 5. More evening passes for the Advanced Composite Solar Sail System (ACS3) are predicted from January 25 to February 4. These predictions are subject to change. 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.

HAPPY OBSERVING!