

OBSERVING HIGHLIGHTS for November 20 to December 4, 2023, a “bright” Moon period.
Black Canyon Astronomical Society (BCAS), western Colorado, USA

SUMMARY. After twilight ends during this “bright Moon” period, striking Jupiter is rising higher in the east and remains visible nearly all night long. After sunset Saturn becomes visible in the south and sets in the west southwest before midnight. During evening twilight between December 1 and 4, challenge yourself to spot Mercury very low to the west-southwestern horizon. Venus is still a brilliant “morning star”, rising in the east before 3:45 AM MST. With a telescope, you can watch the shadows of three of Jupiter’s large moons cross the Giant Planet during this period, including two transits of the large shadow of Ganymede, one occurring during “prime time” evening hours on November 24, the other centered around midnight on December 1-2.

The Moon is at first quarter on November 20. From November 21 to 25, watch a gibbous Moon wax. The Moon is full on the night of November 26-27. From November 28 to December 3, we can watch a gibbous Moon wane. The Moon reaches last quarter on the night of December 4-5. On the evening of November 20, the 57%-illuminated Moon is about 7 degrees southeast of Saturn. On the night of November 24-25, a “fatter” gibbous Moon (94% illuminated) is a few degrees west of Jupiter.

Two large active regions with sunspots have rotated into view from Earth, and we can expect frequent solar flares and coronal mass ejections of charged particles. You can monitor solar activity safely in real time on the internet. High solar activity is triggering auroras (aka “northern lights”) and airglow, which have been photographed and seen from Colorado in the past several months. So, keep watch for more of these phenomena!

Also, there are evening passes of the bright International Space Station (ISS) from November 19 to 23 and from November 29 to December 4, plus evening passes of the almost-as-bright Tiangong (Chinese) Space Station from November 19 to December 4.

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 Wednesdays. On November 24 and 29, Art Trevena presents “Astronomy Highlights for 2024.”

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 is at **first quarter on November 20** (exactly at 3:50 AM MST). From November 21 to 25, we can watch a gibbous Moon wax. **The Moon is full on the night of November 26-27** (exactly full at 2:16 AM MST on Nov. 27). On evenings from November 28 to December 3, we can watch a gibbous Moon wane. The Moon reaches **last quarter on the night of December 4-5** (exactly at 10:49 PM MST). On the evening of November 20, the 57%-illuminated Moon, just beyond first quarter, is about 7 degrees southeast of Saturn. On the night of November 24-25, the waxing gibbous Moon (94% illuminated) is a few degrees west of Jupiter. You can find a stunning visualization of lunar phases for all of year 2023 here: [Moon Phase and Libration 2023 - Moon: NASA Science.](#)

MERCURY CHALLENGE: TRY TO SPOT THE “EVENING STAR”! For the third time in 2023, the “Speedster Planet” is appearing in our evening sky. However, Mercury is moving against the stars of southern Ophiuchus and Sagittarius, about as far south as it can get, making it challenging to see in twilight from Colorado’s mid-northern latitudes. Try to spot Mercury, shining at magnitude -0.4, between December 1 and 4 at about 5:40 PM MST, when the Innermost Planet will be just a few degrees above the west-southwestern horizon (with the Sun about 10 degrees below that horizon). Find a spot that is unobstructed in the west southwest. Binoculars may help. Mercury is at maximum angular separation from the Sun on December 4, when it will be 93 million miles distant. Through telescopes on December 4, Mercury’s gibbous disk, 6.8 arc seconds in diameter, will appear 68% illuminated. **Please do your Mercury spotting after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.**

SATURN IN THE EVENING. As evening twilight fades, Saturn is more than 35 degrees above the southern horizon. The Ringed Planet remains visible though the late evening, setting in the southwest at about 11:46 PM MST on November 20 and 10:50 PM MST on December 4. Between November 20 and December 4, Saturn fades from magnitude +0.82 to +0.85, as its distance from Earth increases from 898 to 919 million miles. Telescopes of any size will reveal Saturn’s stunning rings. Saturn’s disk now appears about 17 arc seconds wide, and its rings span 39 arc seconds. With a telescope or high-magnification binoculars, it's possible to spot Titan, Saturn’s largest moon. Telescopes with apertures 6 inches or larger may reveal several other moons of the Ringed Planet. From Earth’s perspective during 2023, Saturn’s rings are less inclined than they have been during the past several years, so they may appear less impressive in telescopes. These thin rings will appear nearly edge-on and almost disappear during 2025, so view Saturn telescopically this year! Because Saturn’s rings appear less inclined, and therefore 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 referring to various planetarium apps and/or this site: <https://skyandtelescope.org/observing/interactive-sky-watching-tools/saturns-moons-javascript-utility/>

JUPITER: BRIGHT FOR MOST OF THE NIGHT. As twilight fades, Jupiter shines brightly about 20 degrees above the eastern horizon. Between November 20 and December 4, the Giant Planet fades just a bit (from magnitude -2.9 to -2.8), as its distance from Earth increases from 376 to 385 million miles. Jupiter sets in the west northwest at about 5:24 AM MST on November 20 and 4:23 AM MST on December 4. Through telescopes or binoculars, the Giant Planet’s apparent equatorial diameter decreases from 48.9 to 47.6 arc seconds during this period. Use a telescope or binoculars to spot Jupiter’s four bright 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

If you have a telescope, try viewing shadow transits (Jovian solar eclipses!) of Jupiter’s moons on the mornings listed below. **Ganymede, the largest moon in the Solar System, casts the largest shadow of Jupiter’s moons, and it’s the easiest shadow to spot crossing the Giant Planet. There is a “prime time” transit of Ganymede’s shadow on Nov. 24 from 7:02 to 8:52 PM MST, and another that is centered around midnight on Dec. 2-3.** Europa’s small shadow can be challenging to spot. Io’s shadow is larger than Europa’s but smaller than Ganymede’s shadow. Callisto’s shadow does not cross Jupiter this year.

November 20, 2023, 7:18 to 9:28 PM MST, Io’s shadow crosses Jupiter.

November 24, 2023, 7:02 to 8:52 PM MST, Ganymede’s shadow crosses Jupiter at high latitude in Jupiter’s southern hemisphere.

November 26, 2023, 2:44 to 4:56 AM MST, Io's shadow crosses Jupiter (Locally, Jupiter sets at 4:58 AM MST).

November 27, 2023, 9:14 to 11:24 PM MST, Io's shadow crosses Jupiter.

November 28, 2023, 3:16 to 5:42 PM MST, Europa's shadow crosses Jupiter (Locally, Jupiter rises at 3:19 PM MST and the Sun sets at 4:52 PM MST).

November 29, 2023, 3:42 to 5:54 PM MST, Io's shadow crosses Jupiter (Locally, Jupiter rises at 3:14 PM MST, and the Sun sets at 4:52 PM MST).

December 1-2, 2023, 11:02 PM to 12:54 AM MST, Ganymede's shadow crosses Jupiter at high latitude in Jupiter's southern hemisphere.

December 4-5, 2023, 11:10 PM to 1:20 AM MST, Io's shadow crosses Jupiter.

VENUS - STILL A BRILLIANT "MORNING STAR"! Venus is still a beacon in the predawn sky, rising before morning twilight, at about 3:17 AM MST on November 20 and 3:41 AM MST on December 4. Venus, although still brilliant, fades a bit (from magnitude -4.26 to -4.17) between November 20 and December 4, as its distance from Earth increases from 84 to 93 million miles and its apparent diameter (as seen through telescopes) decreases from 18.6 to 16.7 arc seconds. Use a telescope to watch Venus' gibbous phase wax from 63% to 69% illuminated between November 20 and December 4. **Please do your Venus spotting before sunrise. NEVER chance looking at the Sun directly; serious eye damage can result.**

THE SUN. The Sun has been impressively active this year. M-class ("moderate") solar flares have been occurring most weeks, and X-class ("extreme") flares occurred on January 5, 9, 10, February 11, 17, March 3, 29, June 20, July 2, and August 5 and 7, 2023. There also have been coronal mass ejections ("CMEs") of charged particles that have triggered auroras. [Aur glow](#) also results from [high solar activity](#), and this phenomenon has been photographed and observed from Colorado. As of November 19, two major active regions/sunspot groups have rotated into view from Earth. Between November 19 and December 4, M-class solar flares are likely, and X-class flares are possible. Some flares may be associated with CMEs. 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://halphi.nso.edu/>

<https://www.swpc.noaa.gov/>

<https://sohowww.nascom.nasa.gov/data/realtime-images.html>

<http://www.sidc.be/silso/ssngraphics>

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 in recent months auroras were photographed and seen from Colorado and even farther south in Arizona! Solar magnetic storms, when directed toward Earth, can

cause auroras. With current, high solar activity, chances for auroras are good. You can get predictions for auroras, their intensity, and geographic extent from NOAA's Space Weather Prediction Center: <https://www.swpc.noaa.gov/>.

From September through April, we usually can watch aurora in real-time from Yellowknife, Northwest Territories on an all-sky camera at the [Canadian Space Agency's AuroraMax website](#). Unfortunately, the start of AuroraMax has been postponed by recent wildfires in the Yellowknife region. Like Colorado, Yellowknife is in the Mountain Time Zone. Hopefully, this site will be restored soon. Although few employ an all-sky camera like AuroraMax, other aurora webcams are now operating - see this review article at:

[Northern lights webcams: Watch the aurora borealis online for free | Space](#)

Here's a link to another aurora webcam in the Mountain Time Zone, at Banff, Alberta, Canada...

<https://www.youtube.com/watch?v=2zt8AUDH8Us>

An aurora webcam at the University of Alaska-Fairbanks is two hours behind the Mountain Time Zone...

<https://www.youtube.com/watch?v=O52zDyXg5QI>

There are many hours of darkness at Fairbanks' high northern latitude from November through January.

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. These predictions for satellite passes may be inaccurate by up to several minutes, especially after November 23. For more accurate predictions of these and other satellites, 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.

Check Heavens-Above.com (or other sites) for updated, local predictions of "trains" of Starlink satellites. Starlink satellite trains, when viewed from less than 1 day to about 4 days after launch, can be very eye-catching!

November 19, 2023. International Space Station (ISS). 5:57 to 6:00 to 6:03 PM MST. W to NNW to NNE, max altitude 35 deg above NNW, disappears into Earth's shadow 15 deg above NNE, max magnitude -2.2 (Passing through Ophiuchus, Hercules, Draco, Ursa Minor, and Camelopardalis). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

November 19, 2023. Tiangong (Chinese Space Station). 6:46 to 6:48 PM MST. SW to SSW, disappears into Earth's shadow at max altitude 31 deg above SSW, max magnitude -0.7 (Passing through Sagittarius and Capricornus). **Tiangong's orbit may change frequently. Check for updates.**

November 20, 2023. Tiangong (Chinese Space Station). 5:46 to 5:49 to 5:51 PM MST. SSW to SSE to E, max altitude 25 deg above SSE, disappears into Earth's shadow 15 deg above E, max magnitude -0.6 (Passing through Sagittarius/Corona Australis, Capricornus/Microscopium, Aquarius/Piscis Austrinus, and Cetus/Pisces). **Tiangong's orbit may change frequently. Check for updates.**

November 20, 2023. International Space Station (ISS). 6:48 to 6:50 PM MST. NW to NNW, disappears into Earth's shadow at max altitude 14 deg above NNW, max magnitude -1.2 (Passing through Corona

Borealis, Boötes, and Draco/Ursa Major). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

November 21, 2023. International Space Station (ISS). 5:59 to 6:01 to 6:03 PM MST. WNW to NNW to NNE, max altitude 18 deg above NNW, disappears into Earth's shadow 11 deg above NNE, max magnitude -1.5 (Passing through Corona Borealis, Boötes, Draco/Ursa Major, and Camelopardalis). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

November 21, 2023. Tiangong (Chinese Space Station). 6:21 to 6:24 to 6:25 PM MST. WSW to SSE to ESE, max altitude 73 deg above SSE, disappears into Earth's shadow 60 deg above ESE, max magnitude -2.2 (Passing through Scutum, Aquila, Delphinus, Pegasus, and Andromeda). **Tiangong's orbit may change frequently. Check for updates.**

November 22, 2023. Tiangong (Chinese Space Station). 5:21 to 5:24 to 5:27 PM MST. SW to SSE to E, max altitude 42 deg above SSE, disappears into Earth's shadow 8 deg above E, max magnitude -1.4 (Passing through Sagittarius, Capricornus, Aquarius, and Pisces/Aries-near Jupiter). **Tiangong's orbit may change frequently. Check for updates.**

November 23, 2023. Tiangong (Chinese Space Station). 5:57 to 6:00 to 6:02 PM MST. WSW to NNW to ENE, max altitude 75 deg above NNW, disappears into Earth's shadow 26 deg above ENE, max magnitude -2.2 (Passing through Ophiuchus, Lyra, Cygnus, Cassiopeia, and Perseus). **Tiangong's orbit may change frequently. Check for updates.**

November 23, 2023. International Space Station (ISS). 6:00 to 6:02 to 6:03 PM MST. NNW to NNE, max altitude 11 deg above NNW, disappears into Earth's shadow 9 deg above NNE, max magnitude -1.2 (Passing through Boötes and Ursa Major). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

November 24, 2023. Tiangong (Chinese Space Station). 6:33 to 6:36 PM MST. W to NNW, disappears into Earth's shadow at max altitude 46 deg above NNW, max magnitude -1.5 (Passing through Ophiuchus, Hercules, and Draco). **Tiangong's orbit may change frequently. Check for updates.**

November 25, 2023. Tiangong (Chinese Space Station). 5:32 to 5:35 to 5:38 PM MST. W to N to ENE, max altitude 56 deg above N, disappears into Earth's shadow 13 deg above ENE, max magnitude -1.8 (Passing through Hercules, Draco, Cepheus, Cassiopeia, and Perseus/Taurus). **Tiangong's orbit may change frequently. Check for updates.**

November 26, 2023. Tiangong (Chinese Space Station). 6:08 to 6:11 to 6:12 PM MST. WNW to N to NE, max altitude 45 deg above N, disappears into Earth's shadow 35 deg above NE, max magnitude -1.6 (Passing through Hercules, Draco, Cepheus/Ursa Minor, and Camelopardalis/Perseus). **Tiangong's orbit may change frequently. Check for updates.**

November 27, 2023. Tiangong (Chinese Space Station). 6:43 to 6:46 PM MST. WNW to NW, disappears into Earth's shadow at max altitude 38 deg above NW, max magnitude -0.9 (Passing through Hercules and Draco). **Tiangong's orbit may change frequently. Check for updates.**

November 28, 2023. Tiangong (Chinese Space Station). 5:42 to 5:46 to 5:48 PM MST. WNW to N to ENE, max altitude 49 deg above N, disappears into Earth's shadow 18 deg above ENE, max magnitude -1.8 (Passing through Corona Borealis, Hercules, Draco, Cepheus, Cassiopeia, Perseus, and Taurus). **Tiangong's orbit may change frequently. Check for updates.**

November 29, 2023. International Space Station (ISS). 6:00 to 6:02 PM MST. NW to NNE, disappears into Earth's shadow at max altitude 12 deg above NNE, max magnitude -1.5 (Passing through Ursa Major). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

November 29, 2023. Tiangong (Chinese Space Station). 6:18 to 6:21 to 6:22 PM MST. WNW to NNE to E, max altitude 85 deg above NNE, disappears into Earth's shadow 58 deg above E, max magnitude -2.3 (Passing through Hercules, Lyra-near Vega, Cygnus-near Deneb, Lacerta, and Andromeda). **Tiangong's orbit may change frequently. Check for updates.**

November 30, 2023. Tiangong (Chinese Space Station). 5:17 to 5:20 to 5:23 PM MST (1st PM Tiangong Pass of Nov. 30). WNW to NNE to E, maximum altitude 60 deg above NNE, disappears into Earth's shadow 6 deg above E, max magnitude -2.0 (Passing through Corona Borealis, Hercules, Draco, Cepheus, Cassiopeia, Andromeda, Triangulum, Aries, and Cetus). **Tiangong's orbit may change frequently. Check for updates.**

November 30, 2023. Tiangong (Chinese Space Station). 6:53 to 6:56 PM MST (2nd PM Tiangong Pass of Nov. 30). WNW to WSW, disappears into Earth's shadow at max altitude 31 deg above WSW, max magnitude -0.3 (Passing through Ophiuchus and Aquila). **Tiangong's orbit may change frequently. Check for updates.**

December 1, 2023. Tiangong (Chinese Space Station). 5:52 to 5:56 to 5:58 PM MST. WNW to SSW to ESE, max altitude 63 deg above SSW, disappears into Earth's 13 deg above ESE, max magnitude -1.8 (Passing through Hercules, Cygnus/Sagitta, Delphinus, Pegasus, Pisces, and Cetus). **Tiangong's orbit may change frequently. Check for updates.**

December 1, 2023. International Space Station (ISS). 5:58 to 6:01 to 6:02 PM MST. NNW to NNE to NE, maximum altitude 20 deg above NNE, disappears into Earth's shadow 19 deg above NE, max magnitude -2.2 (Passing through Ursa Major/Draco and Camelopardalis). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

December 2, 2023. Tiangong (Chinese Space Station). 6:28 to 6:31 to 6:33 PM MST. W to SSW to SSE, max altitude 21 deg above SSW, disappears into Earth's 13 deg above SSE, max magnitude +0.2 (Passing through Ophiuchus, Aquila/Scutum, Capricornus, and Piscis Austrinus). **Tiangong's orbit may change frequently. Check for updates.**

December 2, 2023. International Space Station (ISS). 6:45 to 6:48 PM MST. in NW, disappears into Earth's shadow at max altitude 34 deg above NW, max magnitude -2.5 (Passing through Corona Borealis, Hercules, and Draco). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

December 3, 2023. Tiangong (Chinese Space Station). 5:26 to 5:30 to 5:33 PM MST. W to SSW to SE, max altitude 38 deg above SSW, max magnitude -0.7 (Passing through Ophiuchus, Aquila,

Capricornus/Aquarius, and Cetus/Sculptor). **Tiangong's orbit may change frequently. Check for updates.**

December 3, 2023. International Space Station (ISS). 5:56 to 6:00 to 6:01 PM MST. NW to NNE to E, max altitude 40 deg above NNE, disappears into Earth's shadow 25 deg above E, max magnitude -3.3 (Passing through Boötes, Draco, Ursa Minor, Camelopardalis, Perseus, and Taurus/Aries). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

December 4, 2023. Tiangong (Chinese Space Station). 6:03 to 6:05 to 6:06 PM MST. WSW to SW to S, max altitude 13 deg above SW, max magnitude +1.0 (Passing through Ophiuchus, Scutum, Sagittarius, Microscopium, and Grus). **Tiangong's orbit may change frequently. Check for updates.**

December 4, 2023. International Space Station (ISS). 6:43 to 6:48 PM MST. WNW to SW to SSW, max altitude 35 deg above SW, disappears into Earth's shadow 30 deg above SSW, max magnitude -2.3 (Passing through Hercules, Aquila, Aquarius, and Capricornus). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

HAPPY OBSERVING!