OBSERVING HIGHLIGHTS for July 27 to August 12, 2024, a "dark Moon period"
Black Canyon Astronomical Society (BCAS), western Colorado, USA

SUMMARY. As twilight ends during this "dark Moon period", Saturn is rising in the east southeast, and the summer Milky Way extends from the bright star clouds of Constellation Sagittarius in the south, up through Constellations Scutum and Aquila, to Cygnus, high in the east, through Cepheus, Cassiopeia, and Perseus in the north northeast. Spring Constellations, including Virgo, Boötes, and Coma Berenices, are descending in the west, as our fall Constellations, Aquarius, Pegasus, and Andromeda are rising in the east. Use binoculars or a telescope to explore the numerous star clusters and nebulae of the summer Milky Way! Rise early to spot heliacal risings of Orion's bright stars by early August and the heliacal rising of Sirius, the brightest star, by August 12. "Heliacal rising" refers to a star's first visible rising before the Sun during the year. The heliacal risings of these "winter stars" portend cooler weather to come! The Perseid Meteor Shower is likely to be very active from about August 9 through August 15. Try to spot some Perseids during the dark (moonless) wee hours, especially on the morning of August 12, the predicted peak, when you may see up to 100 meteors per hour. You can explore wonders of the summer sky with telescopes at Black Canyon of the Gunnison National Park on July 31, August 2, and August 7. Also, there is a Perseid Meteor watch at Top of the Pines in Ouray County on the night of August 10-11.

Mercury departs the evening sky by early August, but Venus is now shining brightly in the western evening twilight. You may still be able to glimpse Comet 13P/Olbers above the northwestern horizon with a telescope or binoculars during and after late evening twilight. Reddish Mars becomes prominent in the morning sky after 2:15 AM MDT, and bright Jupiter rises before 2:30 AM MDT. Morning-by-morning, watch Mars appear nearer Jupiter, before their very close conjunction on August 14. If you have a telescope, on August 7 between 1:45 and 2:58 AM MDT, watch shadows of Jupiter's moons Io and Europa move across the Giant Planet simultaneously during a double solar eclipse on Jupiter!

The Moon is at last quarter on July 27. On mornings from July 28 to August 3, the crescent Moon wanes. On July 30 between 4 and 5 AM MDT, look for the crescent Moon forming a striking 8-by-5 degree "Southern Cross like spectacle" with Mars, Jupiter, and the red giant star, Aldebaran.
The Moon is new, and consequently invisible, on August 4. On evenings from August 5 to 11, watch a crescent Moon wax. The Moon reaches first quarter on August 12. On August 5 at about 8:45 PM MDT, look for a thin crescent Moon about 5 degrees above the west-northwestern horizon and just 1 degree above Venus. Use binoculars to spot earthshine on the nightside of the crescent Moon, especially on mornings from July 29 to August 3, and on evenings from August 5 to 9.

The Sun has been very active recently. There were X-class (extreme) solar flares on July 14 and 16, and recent coronal mass ejections (CMEs) of charged particles. As of July 26, there are several active regions with sunspots on the Earth-facing side of the Sun. So, moderate and even extreme solar flares and powerful CMEs are likely during this period. CMEs may trigger geomagnetic storms and auroras. You can monitor solar activity safely in real time on the internet. You can also find online the likelihood for auroras.

From western Colorado, try to spot evening passes of the bright International Space Station (ISS) from July 26 to August 1 and evening passes of the almost-as-bright Tiangong (Chinese) Space Station from July 26 to August 10.

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 August 2 and 7, Xennia Perry, an astronomy student of Dr. Catherine Whiting at Colorado Mesa University, presents "The Perseid Meteor Shower."

JULY-EARLY AUGUST OBSERVING EVENTS IN THE BCAS REGION (open to the public)
July 31, after 9:30 PM, Black Canyon of the Gunnison N.P., South Rim, near campground (NPS&BCAS)
August 2, after 9:30 PM, Black Canyon of the Gunnison N.P., South Rim, near campground (NPS&BCAS)
August 7, after 9:30 PM, Black Canyon of the Gunnison N.P., South Rim, near campground (NPS&BCAS)
August 10-11, Perseid Meteor Shower watch, Top of the Pines (Ouray County & BCAS)

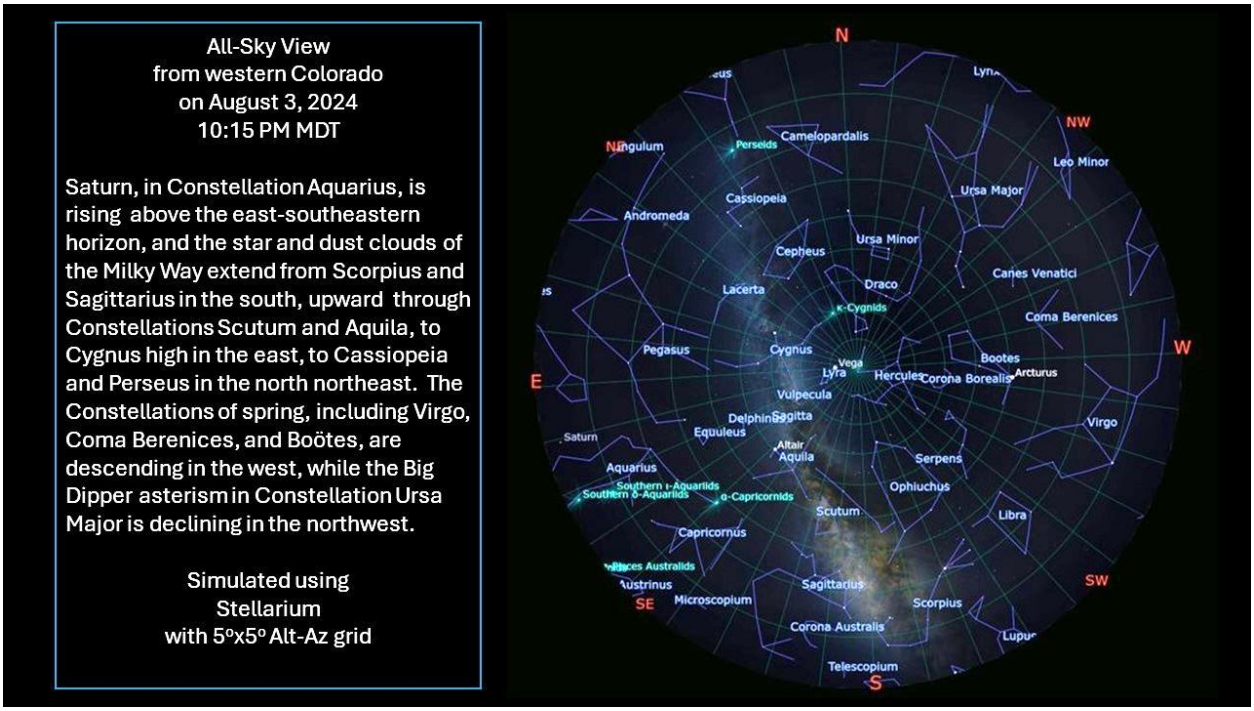
Note: The apparent brightness of sky objects is measured in "magnitude" units. Many bright stars are magnitude +1, while the faintest stars easily visible to unaided eyes under dark skies are magnitude +6. Some of the brightest stars are 0 magnitude (e.g., Vega, Arcturus), while the brightest sky objects 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 PERSEID METEOR SHOWER! The Perseid Meteor Shower is typically the best annual meteor shower that is visible from Colorado during our "warm season." Perseid Meteors are icy and rocky particles (typically the size of sand grains) from periodic comet 109P/Swift-Tuttle, which last entered the inner Solar System in 1992. This debris is distributed around the Comet's orbit of the Sun. As Earth passes through 109P's orbital plane each year, these particles become Perseid Meteors when they enter our atmosphere at about 130,000 miles per hour and cause bright incandescence. The Perseid Shower is active from July 17 to August 24. In 2024, maximum activity is predicted for the morning of August 12, when up to 100 meteors per hour may be visible under ideal conditions. The Perseid peak is typically broad. So, if it's cloudy on August 12, it's worth looking for Perseids on several mornings both before and after the predicted peak. Meteor observing is easy. You don't need any equipment, just clear, dark skies. From a reclining chair, look high in the sky after the Moon has set and before the start of bright, morning twilight. There are several good reasons to look for Perseid Meteors after midnight: 1) meteors become more frequent as the Perseid radiant (apparent origin point on the sky) rises higher after midnight, 2) in the hours before dawn, our location on Earth rotates to face the oncoming meteoroid stream, further increasing meteor activity, 3) convective clouds (and associated thunderstorms) often dissipate during the wee hours, and 4) the wee hours are dark before August 13, because the Moon sets earlier in the night. You can find more about the Perseids and other meteor showers in the 2024 calendar of the International Meteor Organization. The following table gives "dark times" for western Colorado (moonset to beginning of nautical twilight when the Sun reaches -12^{o} altitude) during the likely period of high Perseid activity in 2024:

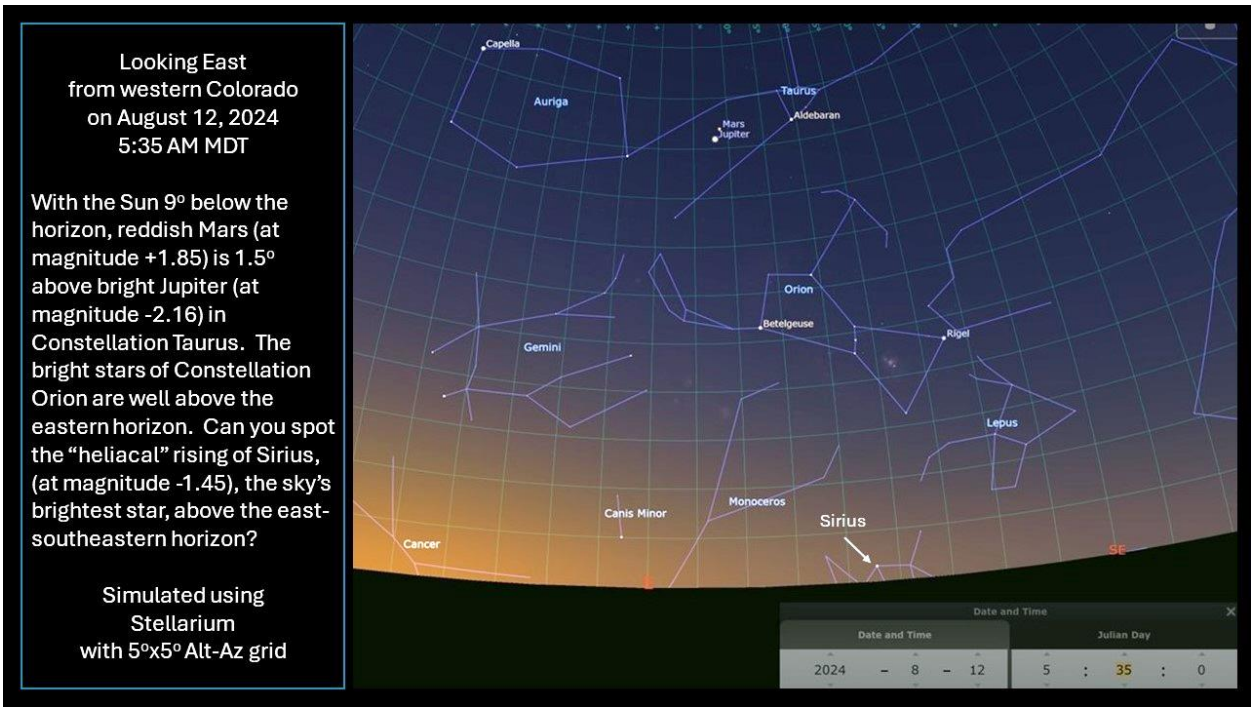
August 9-10, 10:40 PM to 5:17 AM MDT
August 10-11, 11:02 PM to 5:18 AM MDT
August 11-12, 11:27 PM to 5:19 AM MDT (expected peak)
August 12-13, 11:58 PM to 5:21 AM MDT
August 13-14, 12:36 AM to 5:22 AM MDT
August 14-15, 1:24 AM to 5:23 AM MDT
August 15-16, 2:23 AM to 5:24 AM MDT

A STRIKING MID-SUMMER SKY. On midsummer evenings during this "dark Moon period", take in Saturn, rising just south of east, and the brightest parts of the Milky Way, extending from Constellations Scorpius and Sagittarius in the south, upward through Scutum and Aquila, to Cygnus, high in the east. The Milky Way becomes less prominent through Constellations Cepheus, Cassiopeia, and Perseus in the

northeastern sky. The Milky Way appears brightest in Constellation Sagittarius, because that's the direction of the center of our galaxy, where stars are more concentrated. Stars and constellations of our spring sky, like blue-white Spica in Virgo and reddish Arcturus in Boötes are receding toward the western horizon, as the Big Dipper declines in the north northwest. By the wee morning hours, the Milky Way moves into the western sky, as our "fall constellations", like Pegasus, Andromeda, and Aquarius gain altitude in the east. Use a planetarium app or the chart below to navigate the striking evening sky of midsummer.



HELIACAL RISINGS OF ORION'S BRIGHT STARS AND SIRIUS. The term "heliacal rising" refers to the first visible rising of a star before sunrise during the year. The stars of our winter sky have been hidden in the Sun's glare from late spring through early summer. But now in midsummer, as Earth moves in its orbit about the Sun, our winter stars are reappearing in the eastern sky before dawn. By August 1 between 4:45 and 5:15 AM MDT, can you spot above the eastern horizon the heliacal risings of Rigel and Betelgeuse, Orion's two brightest stars? It may be possible to spot these stars as early as July 27, if you have an unobstructed eastern horizon. By August 12, you likely can also see the second-magnitude stars of Orion's "belt", as they rise before bright twilight. Ancient Egyptians are said to have used the heliacal rising of Sirius, the sky's brightest star, to predict the annual flood of the Nile. On August 12 at about 5:35 AM MDT, can you spot Sirius in bright twilight just above the east-southeastern horizon? By late August, Sirius will become easier to spot in a darker, pre-dawn sky. Although we don't use heliacal risings to predict floods in Colorado, the heliacal risings of Rigel, Betelgeuse, and Sirius do portend the cooler weather to come. The chart below may help you find the bright stars of Constellation Orion and Sirius, aka "the Dog Star."



THE MOON. The Moon reaches **last quarter on July 27** (exactly at 8:51 PM MDT). On mornings from July 28 to August 3, the crescent Moon wanes. On July 30 between 4 and 5 AM MDT, the 25%-illuminated, crescent Moon forms a 8-by 5-degree, "Southern Cross-like spectacle" with Mars, Jupiter and the red giant star, Aldebaran. **The Moon is new, and consequently invisible, on August 4** (exactly new at 6:13 AM MDT). On evenings from August 5 to 11, we can watch a crescent Moon wax. The Moon reaches **first quarter on August 12** (at exactly 11:19 AM MDT). On August 5 at about 8:45 PM MDT, look for a thin (2.5%-illuminated), crescent Moon about 5 degrees above the west-northwestern horizon and just 1 degree above brilliant Venus. Enjoy seeing earthshine on the dark, nightside of the crescent Moon, especially on mornings from July 29 to August 3, and on evenings from August 5 to 9 (binoculars can provide eye-catching views). NASA has published a stunning visualization of lunar phases for year 2024. 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 AS AN "EVENING STAR." We can now see Venus above the western horizon during evening twilight. On July 27 at about 9:00 PM MDT, try to spot Venus, shining at magnitude -3.9, just 2.5 degrees above the west-northwestern horizon, when the Sun is about 6 degrees below the horizon. On August 12 at about 8:35 PM MDT, Venus stands about 5 degrees above the western horizon, with the Sun about 5 degrees below the horizon. Venus is still on the far side of the Sun from our perspective, 154 million miles distant on July 27, and 149 million miles distant on August 12. Through telescopes Venus appears at nearly full phase. Between July 27 and August 12, Venus' 10-arc-second-wide, gibbous disk wanes from 97% to 94% illuminated. Venus will get easier to spot gradually through the following weeks, as, evening-by-evening, our Sister Planet appears farther east and south from the Sun. **Please do your Venus spotting after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.**

FAREWELL TO MERCURY IN THE EVENINGS. On July 27 at about 9:10 PM MDT, use binoculars or a telescope to spot Mercury, shining at magnitude +0.70 just 3.5 degrees above an unobstructed western horizon (when the Sun is about 8 degrees below the horizon). After July 27, Mercury fades quickly as its phase wanes rapidly from a 35%-illuminated crescent, and its angular separation from the Sun decreases. On July 30 at about 9:00 PM, try using binoculars to find Mercury (magnitude +0.87) about 9 degrees left from bright Venus (magnitude -3.9), just 3 degrees above an unobstructed, western horizon. By early August the "Speedster Planet" continues fading and becomes very difficult to spot, as it retrogrades into glaring twilight before its solar conjunction. Mercury is 72 million miles distant on July 27, and as a crescent, it appears 8.7 arc seconds wide through telescopes. The Innermost Planet will be only 57 million miles distant (but invisible) when at inferior solar conjunction on August 18. **Please do your Mercury spotting after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.**

SATURN RISES IN THE EVENING. Saturn rises just south of east at about 10:28 PM MDT on July 27 and 9:22 PM MDT on August 12. The Ringed Planet is easy to spot in the southeast and south from about 11 PM MDT until morning twilight brightens the sky. Earth is drawing nearer to Saturn, from 828 million miles distant on July 27 to 814 million miles distant on August 12. Saturn brightens slightly from magnitude +0.77 on July 13 to magnitude +0.69 on August 12. Through telescopes, the Ringed Planet appears 19 arc seconds wide, and its rings span 44 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 in the past several years. These thin rings will nearly disappear from our perspective during 2025. Because Saturn's rings now 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/

13P/OLBERS: AN EVENING COMET FOR TELESCOPES (AND BINOCULAS). Using a telescope (or binoculars), challenge yourself to spot periodic **Comet 13P/Olbers** above the northwestern horizon during and/or just after evening twilight. We've enjoyed nice views of this Comet during BCAS public events in July. Look for 13P in the northwest between 9:40 and 10:45 PM MDT, as it moves against the stars of Constellations Leo Minor and Ursa Major. For finder charts, photos, brightness info, an ephemeris, and other info on 13P/Olbers, see these links…
http://www.aerith.net/comet/catalog/0013P/2024.html
13P/Olbers | astro.vanbuitenen.nl
https://skyandtelescope.org/astronomy-news/the-best-comets-in-2024/

AWAITING COMET TSUCHINSHAN-ATLAS (C/2023 A3). When it enters the inner Solar System in early fall, Comet **Tsuchinshan-ATLAS (C/2023 A3)** may become a striking sight, especially during evenings in mid-to-late October. But that's only if it survives its perihelion pass about 36 million miles from the Sun on September 27. C/2023 A3 is now shining dimly at magnitude +10 to +9 and fully engulfed in bright evening twilight. By the last week of September, C/2023 A3 may appear low above the eastern horizon before dawn. For the best viewing, we are hoping that this Comet survives its late September brush with the Sun and then emerges brightly into the evening sky during mid to late October. You can find images, brightness info, finder charts, and an ephemeris for C/2023 A3 at these links…
http://astro.vanbuitenen.nl/comet/2023A3
http://www.aerith.net/comet/catalog/2023A3/2023A3.html

https://skyandtelescope.org/astronomy-news/the-best-comets-in-2024/
Please do your C/2023 A3 spotting after sunset (or before sunrise). NEVER chance looking at the Sun directly; serious eye damage can result.

MARS IN THE WEE HOURS. Reddish Mars rises in the east at about 1:47 AM MDT on July 27 and 1:23 AM MDT on August 12. Mars is prominent in the eastern sky after about 2:15 AM MDT until morning twilight starts interfering. From July 27 to August 12, Mars brightens slightly from magnitude +0.94 to + 0.83, as its distance from Earth decreases from 151 to 143 million miles. During this period, Mars is still on the far side of the Sun from our perspective, and through telescopes its disk appears small, less than 6.1 arc seconds wide. On August 12, Mars appears just 1.5 degrees above bright Jupiter, and it's closing fast! On August 14, Mars will appear only 0.3 degrees above Jupiter - within the same field of view for most telescopes!

JUPITER BEFORE DAWN. Bright Jupiter rises in the east northeast at about 2:21 AM MDT on July 27 and 1:30 AM MDT on August 12. The Giant Planet is prominent in the mornings from shortly after it rises through bright morning twilight. During this period Jupiter brightens from magnitude -2.09 to -2.16, as its distance from Earth decreases from 521 to 502 million miles. Through telescopes or binoculars, the Giant Planet's apparent equatorial diameter increases from 35.2 to 36.5 arc seconds during this period. On August 12, Mars appears only 1.5 degrees above Jupiter, before the close Jupiter/Mars conjunction on August 14 (as described above). 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
If you are an early riser (or a "night owl"), use a telescope to view shadow transits (total solar eclipses on Jupiter!) by Jupiter's large moons (see details below). As Jupiter becomes visible through much of the night in the following weeks, many more of these Jovian solar eclipses will be visible.

July 29, 2024, 4:24 to 6:36 AM MDT, Io's shadow crosses Jupiter (Locally, the Sun rises at about 6:12 AM MDT, so this event ends in daylight).

Note: On August 7, 2024, after Jupiter rises at about 1:45 AM and before 2:58 AM MDT, <u>we can see shadows of both Io and Europa crossing Jupiter at the same time (details below)!</u>

August 7, 2024, 12:46 to 2:58 AM MDT, Io's shadow crosses Jupiter (Locally, Jupiter rises at about 1:45 AM MDT).

August 7, 2024, 12:50 to 3:24 AM MDT, Europa's shadow crosses Jupiter (Locally, Jupiter rises at about 1:45 AM MDT).

KEEP WATCHING THE NORTHERN CROWN! Will there soon be a bright "new" star in Constellation Corona Borealis (the "Northern Crown"), at least briefly? Corona Borealis now stands high in the south southwest as evening twilight fades. T Coronae Borealis (T CrB) is a recurrent nova that may rapidly increase in brightness 1500-fold (to second magnitude) to become the brightest star (or 2nd brightest star) in Corona Borealis sometime between now and September 2024. Then this "new star" may fade rapidly below naked-eye visibility in about a week. As of early on July 26, CrB had not yet detonated. 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 and 16. There also have been CMEs of charged particles that have triggered geomagnetic storms that caused auroras. Many folks in Colorado and elsewhere viewed and/or photographed auroras during the night of May 10-11. As of July 26, there are several active regions 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
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 night of May 10-11, many of us were able to see and/or photograph some amazing auroras from Colorado! A coronal mass ejection (CME) from the Sun was aimed toward our planet. Charged particles from the CME were captured by Earth's magnetic field, energizing the ionosphere, thereby triggering a geomagnetic storm and a widespread aurora. As of July 26, there are several active regions on the Earth-facing side of the Sun, so 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

EARTH SATELLITE HIGHLIGHTS. The following predictions are for western Colorado, specifically Montrose, in Mountain Daylight Time (MDT). 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 by up to many minutes, especially after August 1.</u> 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.

July 26, 2024. International Space Station (ISS). 9:11 to 9:14 to 9:17 PM MDT. 1st PM ISS pass of July 26. NNW to NNE to E. Max altitude 30 deg above NNE, disappears into Earth's shadow 10 deg above E, max magnitude -2.4 (Passing through Lynx, Camelopardalis, Cepheus, Lacerta, and Cygnus/Pegasus). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

July 26, 2024. Tiangong (Chinese Space Station). 10:19 to 10:23 PM MDT. WSW to NNW to NE. Max altitude 87 deg above NNW, disappears into Earth' shadow 83 deg above NE, max magnitude -2.2 (Passing through Virgo, Boötes, and Hercules). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

July 26, 2024. International Space Station (ISS). 10:48 to 10:50 PM MDT. 2nd PM ISS Pass of July 26. WNW to WSW. Disappears into Earth's shadow at max altitude 24 deg above WSW, max magnitude -1.9 (Passing through Leo, Coma Berenices, and Virgo. **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

July 27, 2024. Tiangong (Chinese Space Station). 9:22 to 9:25 to 9:28 PM MDT. WSW to SSE to ENE. Max altitude 61 deg above SSE, disappears into Earth's shadow 9 deg above ENE, max magnitude -2.1 (Passing through Virgo-near Spica, Serpens, Ophiuchus, Aquila, Sagitta, Delphinus/Vulpecula, and Pegasus). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

July 27, 2024. International Space Station (ISS). 9:59 to 10:02 to 10:03 PM MDT. WNW to SW to S. Max altitude 52 deg above SW, disappears into Earth's shadow 39 deg above S, max magnitude -3.4 (Passing through Leo/Leo Minor, Coma Berenices, Boötes-near Arcturus, Serpens, and Ophiuchus). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

July 28, 2024. International Space Station (ISS). 9:10 to 9:13 to 9:16 PM MDT. NW to NE to SE. Max altitude 82 deg above NE, disappears into Earth's shadow 14 deg above SE, max magnitude -3.8 (Passing through Ursa Major-Big Dipper, Draco, Hercules, Aquila, and Capricornus). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

July 28, 2024. Tiangong (Chinese Space Station). 10:01 to 10:04 to 10:06 PM MDT. W to NNW to ENE. Max altitude 60 deg above NNW, disappears into Earth's shadow 25 deg above ENE, max magnitude -1.6 (Passing through Leo, Coma Berenices, Can Venatici, Ursa Major-Big Dipper, Draco, Cepheus, and Lacerta). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

July 29, 2024. Tiangong (Chinese Space Station). 9:03 to 9:06 to 9:09 PM MDT. 1st PM Tiangong pass of July 29. WSW to NNW to ENE. Max altitude 81 deg above NNW, disappears into Earth's shadow 3 deg above ENE, max magnitude -2.0 (Passing through Leo/Virgo, Boötes, Hercules, Draco, Cygnus, and Pegasus). **Predictions for the Tiangong are subject to change due to orbital adjustments.**

July 29, 2024. International Space Station (ISS). 9:59 to 10:01 to 10:02 PM MDT. W to SW to SSW. Max altitude 17 deg above SW, disappears into Earth's shadow 14 deg above SSW, max magnitude -1.6 (Passing through Leo, Virgo, Libra, and Lupus/Scorpius). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

July 29, 2024. Tiangong (Chinese Space Station). 10:40 to 10:43 PM MDT. 2nd PM Tiangong pass of July 29. WNW to NNW. Disappears into Earth's shadow at max altitude 43 deg above NNW, max magnitude -1.0 (Passing through Leo, Canes Venatici, Ursa Major-Big Dipper, and Draco). **Predictions for the Tiangong are subject to change due to orbital adjustments.**

July 30, 2024. International Space Station (ISS). 9:09 to 9:12 to 9:15 PM MDT. WNW to SW to SSE. Max altitude 31 deg above SW, disappears into Earth's shadow 9 deg above SSE, max magnitude -2.3 (Passing through Leo, Virgo, Libra, Scorpius, and Sagittarius). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

July 30, 2024. Tiangong (Chinese Space Station). 9:42 to 9:45 to 9:47 PM MDT. W to N to ENE. Max altitude 48 deg above N, disappears into Earth's shadow 15 deg above ENE, max magnitude -1.1 (Passing through Leo, Canes Venatici, Ursa Major-Big Dipper, Draco, Ursa Minor, Cepheus, Lacerta, and Pegasus). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

July 31, 2024. Tiangong (Chinese Space Station). 10:21 to 10:24 PM MDT. WNW to N to NNE. Max altitude 50 deg above N, disappears into Earth's shadow 49 deg above NNE, max magnitude -1.5 (Passing through Leo, Canes Venatici, Ursa Major-Big Dipper, Draco, Ursa Minor, and Cepheus). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

August 1, 2024. International Space Station (ISS). 9:10 to 9:11 to 9:12 PM MDT. WSW to SW to S. Max altitude 10 deg above SW, max magnitude -0.9 (Passing through Leo, Corvus, Hydra, and Lupus). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

August 1, 2024. Tiangong (Chinese Space Station). 9:23 to 9:26 to 9:29 PM MDT. WNW to N to ENE. Max altitude 46 deg above N, disappears into Earth's shadow 12 deg above ENE, max magnitude -1.2 (Passing through Leo, Canes Venatici, Ursa Major-Big Dipper, Draco, Ursa Minor, Cepheus, Lacerta, and Pegasus). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

August 2, 2024. Tiangong (Chinese Space Station). 10:02 to 10:05 to 10:06 PM MDT. WNW to NNE to ENE. Max altitude 65 deg above NNE, disappears into Earth's shadow 53 deg above ENE, max magnitude -1.9 (Passing through Leo, Canes Venatici, Ursa Major-Big Dipper, Draco, and Cygnus-near Deneb). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

August 3, 2024. Tiangong (Chinese Space Station). 9:04 to 9:07 to 9:10 PM MDT. WNW to N to E. Max altitude 52 deg above N, disappears into Earth's shadow 10 deg above E, max magnitude -1.5 (Passing through Leo, Canes Venatici, Ursa Major-Big Dipper, Draco, Ursa Minor, Draco again,

Cepheus/Cygnus, and Pegasus). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

August 4, 2024. Tiangong (Chinese Space Station). 9:43 to 9:46 to 9:47 PM MDT. WNW to SSW to ESE. Max altitude 83 deg above SSW, disappears into Earth's shadow 43 deg above ESE, max magnitude -2.2 (Passing through Leo, Coma Berenices, Boötes, Hercules, Sagitta/Aquila, and Delphinus). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

August 5, 2024. Tiangong (Chinese Space Station). 8:45 to 8:48 to 8:51 PM MDT. 1st PM Tiangong pass of August 5. WNW to NNE to E. Max altitude 69 deg above NNE, disappears into Earth's shadow 8 deg above E, max magnitude -1.9 (Passing through Leo, Leo Minor, Ursa Major-Big Dipper, Draco, Cygnus, and Equuleus). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

August 5, 2024. Tiangong (Chinese Space Station). 10:21 to 10:24 PM MDT. 2nd PM Tiangong pass of August 5. W to WSW. Disappears into Earth's shadow at max altitude 23 deg above WSW, max magnitude -0.2 (Passing through Leo and Virgo). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

August 6, 2024. Tiangong (Chinese Space Station). 9:23 to 9:26 to 9:28 PM MDT. W to SSW to SE. Max altitude 47 deg above SSW, disappears into Earth's shadow 25 deg above SE, max magnitude -1.6 (Passing through Leo, Virgo/Boötes, Ophiuchus, Scutum, and Sagittarius). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

August 7, 2024. Tiangong (Chinese Space Station). 10:03 to 10:05 PM MDT. WSW to SW. Disappears into Earth's shadow at max altitude 15 deg above SW, max magnitude +0.2 (Passing through Virgo and Libra). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

August 8, 2024. Tiangong (Chinese Space Station). 9:04 to 9:07 to 9:09 PM MDT. W to SSW to SSE. Max altitude 26 deg above SSW, disappears into Earth's shadow 12 deg above SSE, max magnitude -0.5 (Passing through Virgo, Libra, Scorpius-near Antares, and Sagittarius). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

August 10, 2024. Tiangong (Chinese Space Station). 8:45 to 8:47 to 8:49 PM MDT. WSW to SW to S. Max altitude 14 deg above SW, max magnitude +0.5 (Passing through Virgo/Corvus, Hydra, Lupus, Scorpius, and Corona Australis). **Predictions for the Tiangong are subject to change due to orbital adjustments. Check for updated predictions.**

HAPPY OBSERVING!