The Milford Observer

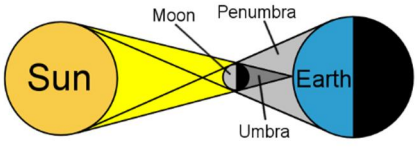
August 2017

INSPIRING FUTURE ASTRONOMERS IS OUR PASSION

The Great American Eclipse

By Jim Goodall

There are few moments in your life that will be remembered as vividly as a total solar eclipse. At least that's what I hear. Like millions of other Americans and eclipse chasers from all over the world, I will be packing up my family in August and heading to a tiny 70-mile-wide strip of land called the "path of totality." On August 21st, the shadow of the moon will cross the entire Unites States, from Oregon to South Carolina, completing its journey in just 93 minutes.



It has been nearly 100 years since such a rare event has occurred across America and there will be only three more in the next 60 years, in 2024, 2045 and 2052. Since clouds are a very real possibility, everyone should consider each total eclipse of the sun to be a once-in-a-lifetime opportunity!

If you are lucky enough to make it to the middle of the path of totality, you will see day turn to night for 2 minutes and 40 seconds. Stars and planets will be visible and the atmosphere of the sun, the corona, will appear as a halo of wispy clouds around the black circle of the moon. (See the next page for a detailed description.)

In the rest of the country, including Michigan, only the partial eclipse will be visible. If you have an opportunity, you should travel to see the total eclipse, the difference between partial and total is literally night and day!

SAFETY FIRST!

When viewing the partial eclipse, ALWAYS wear eye protection!

Normally your eyes are protected from the sun by your brain's "aversion reflex". However, during the solar eclipse, especially when most of the disc of the sun is covered, your brain misinterprets the safety of the situation and permanent damage can result. Remember, even if the sun is 99.9% covered, it is NOT SAFE to view with the naked eye.

Order your glasses now and support the GM Astronomy Club:

eclipse.mpgunderground.com

CLUB HOSTED EVENTS

MPG Open Observing Night

Although a few people showed up for the Open Observing Night on July 21st, our optimism just couldn't keep the clouds away. Let's hope for better weather on Friday, August 11th! Don't forget, the Open Observing Nights at MPG are open to everyone, so bring your whole family! See page 4...

Sidewalk Astronomy

This series is planned as a once-a-month event, usually in downtown Milford. Hundreds of people now have seen the Moon, Jupiter, and Saturn through our club members' telescopes. Join the Overdrive group to stay tuned for future events!

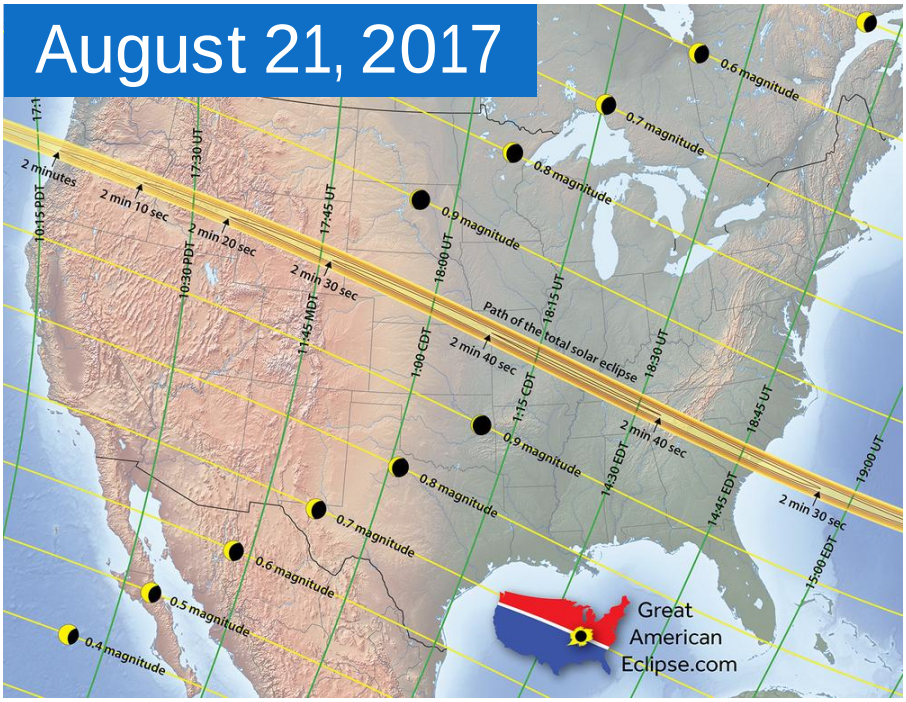


Image credit: https://www.greatamericaneclipse.com/nation/

When & Where?

MICHIGAN ECLIPSE INFO

In southeast Michigan, the eclipse will be only partial, with the moon covering 80% of the disk of the sun.

Start of partial eclipse: 1:00 pm

Maximum coverage: 2:25 pm

End of partial eclipse: 3:45 pm

If you have an opportunity to travel to the path of totality, don't pass it up!

The Experience of Totality

As described by Dan McGlaun, of http://www.eclipse2017.org

"The sky surrounding the Sun will grow very dark very quickly. In real time, you will be able to see the deep blue turn to twilight blue, and then to bluish-black. Stars and planets will pop out of nowhere. Roosters will crow and insects will chirp as though night is falling. If you look to the west, you'll see a beautiful black curtain rising up out of the Earth, with hints of sunset-orange north and south of it, while off to the east, the sky at the horizon is still rather light. On the ground, your shadow will become impossibly clear and thin, and then will vanish completely as the Sun's light fades to about the intensity of the full Moon. In the last few seconds before totality, that dull blackness you saw off to the west will suddenly spring up out of the Earth, and take over the whole sky like a gigantic curtain being pulled over you - like that scene in the original Disney Fantasia movie - only about a hundred times faster. If you aren't focused on the Sun at that time (like most people will be), you'll be looking at the actual shadow of the Moon racing toward you at supersonic speed, covering you with its blackness. If you see that, you're very lucky, because it happens so fast. And besides, you'll probably be too awe-struck by what's going on center stage...

As the last sliver of Sun melts away, you will be able to see several things happening simultaneously. You will now definitely have the feeling that there are two bodies involved, because it is impossible to miss the disk of the Moon in these last seconds. (You should still be watching through the eclipse glasses, by the way.) But while the last bit of the sliver is shrinking, the Sun's corona will start to come out. The last little bit of the Sun's light will glare through valleys on the Moon, and will create a "bead" effect at the edge of the Moon's disk. These are called "Baily's Beads", and they are stunning. These will dance around a little, and then will fade away as the very last one of them brightens into a huge bead. Around the edge of the Moon, the Sun's corona will begin to glow, giving us the famous "diamond ring" effect. It lasts for only about 2-3 seconds, but it is stunning beyond words. Most people will take their filters off at this point (though technically, you're not supposed to look until the diamond ring is totally gone, we're just saying that most people choose to do it anyway). You will see the corona burst into view as the diamond fades away, appearing as though someone is smearing wispy-white cotton candy all around the impossibly black hole that's been cut out of the fabric of the blue-black sky. (We are convinced that the corona comes out while the diamond is still blazing away, and it is a beautiful sight to see.) There may be tongues of red fire visible around the edge of the Sun - these are solar prominences, and no one knows what they will look like until they see them right along with you.

Someone will blow a whistle to signify that totality has officially begun, and you can take your viewing glasses and all your filters off, and stare away. If there's no whistle, then once you can't see anything at all with your filters, take them off! You will see nothing if you keep them on, and now, during totality, they're not necessary! Keep them in your hand for when totality is over, but use your eyes. Use your binoculars with impunity. Don't look away if you can help it. The diamond is gone, all the sun's light is blocked, and you're looking at the most beautiful thing you're likely to ever see - the solar corona, shimmering around the Moon's disk brilliantly (and which is only about as bright as the full Moon). It will look to you as though someone has painted the sky a deep blue-black, has cut an impossibly-black hole in it with a pair of scissors, and then smeared radiant, glowing, shimmering cotton candy around that hole. No picture in the world can do justice to the sight you have before you, and you will want to etch it in your memory forever."

Website Recommendations

GM Astronomy Club – astronomy.mpgunderground.com
(non-GM employees can find us on Facebook)

The Sky Live – www.theskylive.com

Heavens Above – www.heavens-above.com

Stellarium – www.stellarium.org

Equipment Recommendations

There are many different types of telescopes, and the choice is very much dependent on the interests of the individual, but these are some general recommendations:

Binoculars - Celestron SkyMaster – Celestron makes a few levels of binoculars if you are just starting out and not sure you want to buy a telescope or even if you want something small and compact to view space on the go.

Beginner Telescope - Orion 10014 SkyQuest XT4.5 Classic Dobsonian Telescope - this telescopeis easy to use and great for beginners. The size makes it easy to place on the ground for children to see.

Intermediate Telescope - Celestron Advanced VX 8in Schmidt-Cassegrain (SCT) Telescope: the Celestron C8 on an equatorial mount, an excellent scope for intermediate users. The long focal length lends well to planetary viewing, although it is still very capable for deep sky observing and astrophotography.

Accessories

Head Lamp - Coleman Divide+ 225 lm LED Headlamp with Battery Lock - this to be a good headlamp for star parties because it has a red lamp and you don't have to cycle through all the bright modes to turn it on and off. It is also very bright when you need it to be.

Cell Phone Holder - Gosky Universal Cell Phone Adapter Mount – this is a fun accessory to have to take some basic images and share what you are seeing with others online.

Star Finder - The Night Sky 40°-50° (Large) Star Finder – this is nice to have on hand even if you don't have a telescope but wish to learn more about constellations.

Upcoming Events

A brief description is given here. Of course, most of our events are dependent on clear skies, and are subject to cancellation, so please visit our website and join the GM Astronomy Club group on Overdrive to stay tuned to future events.

AUG 11 – MPG Open Observing Night (page 4)

SEP 15 – MPG Open Observing Night (page 4)

TBD – Stay tuned for more Sidewalk Astronomy events…*

**Since Milford's Thursday "Concert in the Park" series has ended for the year, we are open to suggestion for other locations that would be good for sidewalk astronomy on weeknights.

Contact Info

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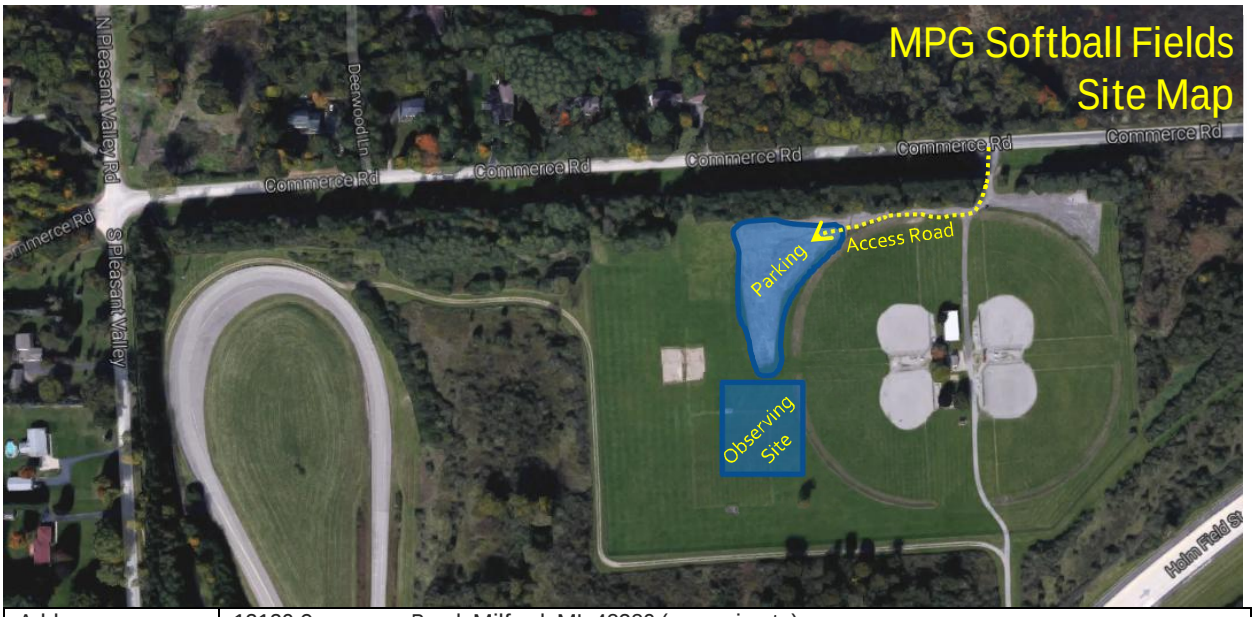
Sponsors

MPG Open Observing Nights

The General Motors Astronomy Club (GMAC) hosts monthly open observing nights at the Milford Proving Ground Softball Fields, typically on the Friday closest to the new moon, with Saturday as a rain date (or cloud date). These events are open to the general public, but the attached liability waiver is required for non-GM-employees. No badge or drive access is needed. Members and non-members are encouraged to bring their own telescope or photography equipment, but, of course, no equipment is required to participate.



Address:	13120 Commerce Road, Milford, MI, 48380 (approximate)
Position:	42°36'15"N 83°41'49"W (42.604167 -83.696944) Elevation: 303 meters (995 feet)
Hours:	Gates open one hour before sunset and close when the last car leaves.
Contacts:	Jim Goodall, GM Astronomy Club, +1 586 709 5888. james.a.goodall@gm.com MPG Security Emergency: +1 248 685 5911

The following etiquette is expected at all GMAC-hosted observing nights:

1) Park your vehicle such that the headlights are pointed away from the observing area, in case you need to leave early. If your schedule permits, please try to arrive before sunset.

2) Minimize the use of bright white lights at the site, as they affect night vision and astrophotography. A small red flashlight is acceptable.

3) In warm weather, bug spray is recommended to keep the mosquitos at bay, but be careful not to apply it near the telescopes as it can damage the optics.

4) Always ask before approaching telescopes and be careful not to bump the scope or trip over wires. Most amateur astronomers enjoy sharing their telescopes with others, but it is important to respect their equipment and wait for an invite before putting your eye to the eyepiece.

5) Cameras are allowed and encouraged for astrophotography and group photos. However it is strictly forbidden to photograph vehicles on GM property, regardless of the security status of the vehicle. Be careful not to include ANY vehicles in your photographs.

Clear Skies!

The Evening Sky Map

FREE* EACH MONTH FOR YOU TO EXPLORE, LEARN & ENJOY THE NIGHT SKY

WWW.SKYMAPS.COM

NORTHERN HEMISPHERE
AUGUST 2017

Sky Calendar – August 2017

Get Sky Calendar on Twitter
http://twitter.com/skymaps

2 **Moon near Antares** (evening sky) at 9h UT.

2 **Venus 2.4° S of M35 cluster** (morning sky) at 15h UT. Mag. –4.0.

2 **Moon at apogee** (farthest from Earth) at 18h UT (distance 405,025 km; angular size 29.5').

3 **Moon near Saturn** (evening sky) at 8h UT. Mag. 0.3.

7 **Partial Eclipse of the Moon** from 17:23 to 19:18 UT, mid-eclipse at 18:20 UT. Visible from the Eastern Hemisphere including Australia, Indonesia and India.

7 **Full Moon** at 18:12 UT.

12 **Perseid meteor shower** peak lasts about 10 hours from 14h UT. Active from July 17 to August 24. Produces swift, bright meteors (50 to 100 per hour) many with persistent trains. Best viewing conditions occur after midnight. Moonlight interferes.

15 **Last Quarter Moon** at 1:16 UT.

15 **Moon near the Pleiades** (morning sky) at 15h UT.

16 **Moon near Aldebaran** (74° from Sun, morning sky) at 7h UT. Occultation visible from the Caribbean.

18 **Moon at perigee** (closest to Earth) at 13:16 UT (366,121 km; angular size 32.6').

19 **Moon near Venus** (morning sky) at 4h UT. Mag. –4.0.

20 **Moon near Beehive cluster** (morning sky) at 7h UT.

21 **Total Solar Eclipse** from 16:49 to 20:03 UT, greatest eclipse at 18:25 UT (duration 2m 40s). Totality visible along narrow, coast-to-coast path across USA. Partial eclipse in North America and northern South America. **NASA Eclipse website:** http://eclipse2017.nasa.gov

21 **New Moon** at 18:30 UT. Start of lunation 1171.

25 **Moon near Jupiter** (evening sky) at 15h UT. Mag. –1.8.

25 **Moon near Spica** (evening sky) at 21h UT.

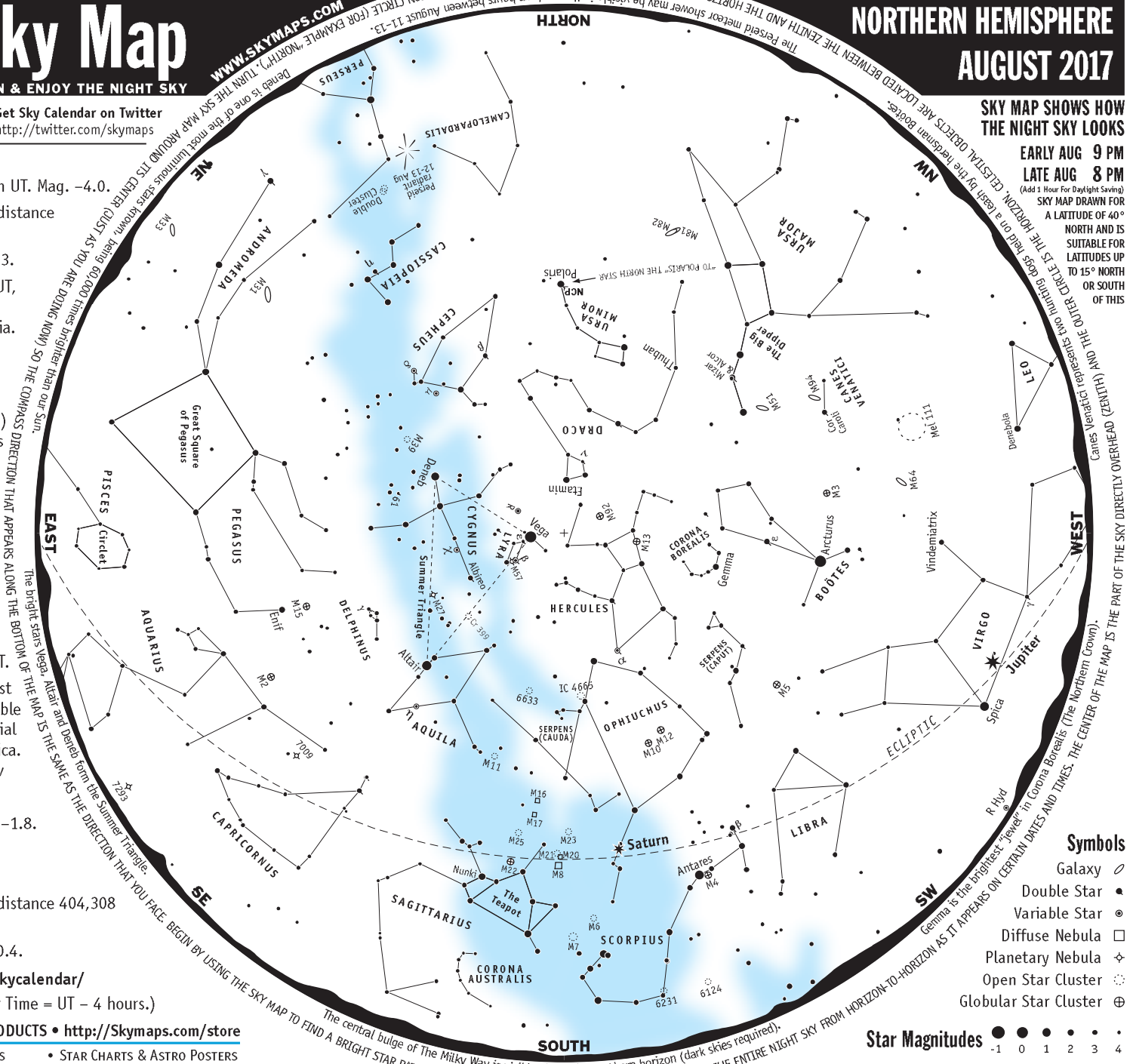
29 **First Quarter Moon** at 8:13 UT.

30 **Moon at apogee** (farthest from Earth) at 11h UT (distance 404,308 km; angular size 29.6').

30 **Moon near Saturn** (evening sky) at 15h UT. Mag. 0.4.

More sky events and links at http://Skymaps.com/skycalendar/

All times in Universal Time (UT). (USA Eastern Summer Time = UT – 4 hours.)



The bright stars Vega, Altair and Deneb form the Summer Triangle.

The central bulge of The Milky Way is visible above the southern horizon (dark skies required).

Gemma is the brightest "jewel" in Corona Borealis (The Northern Crown).

Canes Venatici represents two hunting dogs held on a leash by the herdsman Boötes. THE OUTER CIRCLE IS THE HORIZON. CELESTIAL OBJECTS ARE LOCATED BETWEEN THE ZENITH AND THE HORIZON. COMPASS DIRECTIONS ARE INDICATED ALONG THE HORIZON CIRCLE (FOR EXAMPLE "NORTH"). TURN THE SKY MAP AROUND ITS CENTER (JUST AS YOU ARE DOING NOW) SO THE COMPASS DIRECTION THAT APPEARS ALONG THE BOTTOM OF THE MAP IS THE SAME AS THE DIRECTION THAT YOU FACE. BEGIN BY USING THE SKY MAP TO FIND A BRIGHT STAR PATTERN IN THE SKY.

The Perseid meteor shower may be visible in the predawn hours between August 11-13.

Deneb is one of the most luminous stars known, being 60,000 times brighter than our Sun.

SKY MAP SHOWS HOW THE NIGHT SKY LOOKS

EARLY AUG 9 PM
LATE AUG 8 PM
(Add 1 Hour For Daylight Saving)

SKY MAP DRAWN FOR A LATITUDE OF 40° NORTH AND IS SUITABLE FOR LATITUDES UP TO 15° NORTH OR SOUTH OF THIS

Symbols

Galaxy
Double Star
Variable Star
Diffuse Nebula
Planetary Nebula
Open Star Cluster
Globular Star Cluster

Star Magnitudes -1 0 1 2 3 4

INSTRUCTIONS: THE SKY MAP SHOWS THE ENTIRE NIGHT SKY FROM HORIZON-TO-HORIZON AS IT APPEARS ON CERTAIN DATES AND TIMES. THE CENTER OF THE MAP IS THE PART OF THE SKY DIRECTLY OVERHEAD (ZENITH) AND THE OUTER CIRCLE IS THE HORIZON.

About the Celestial Objects

Listed on this page are several of the brighter, more interesting celestial objects visible in the evening sky this month (refer to the monthly sky map). The objects are grouped into three categories. Those that can be easily seen with the naked eye (that is, without optical aid), those easily seen with binoculars, and those requiring a telescope to be appreciated. **Note, all of the objects (except single stars) will appear more impressive when viewed through a telescope or very large binoculars.** They are grouped in this way to highlight objects that can be seen using the optical equipment that may be available to the star gazer.

Tips for Observing the Night Sky

When observing the night sky, and in particular deep-sky objects such as star clusters, nebulae, and galaxies, it's always best to observe from a dark location. Avoid direct light from street lights and other sources. If possible observe from a dark location away from the light pollution that surrounds many of today's large cities.

You will see more stars after your eyes adapt to the darkness—usually about 10 to 20 minutes after you go outside. Also, if you need to use a torch to view the sky map, cover the light bulb with red cellophane. This will preserve your dark vision.

Finally, even though the Moon is one of the most stunning objects to view through a telescope, its light is so bright that it brightens the sky and makes many of the fainter objects very difficult to see. So try to observe the evening sky on moonless nights around either New Moon or Last Quarter.

Astronomical Glossary

Conjunction – An alignment of two celestial bodies such that they present the least angular separation as viewed from Earth.

Constellation – A defined area of the sky containing a star pattern.

Diffuse Nebula – A cloud of gas illuminated by nearby stars.

Double Star – Two stars that appear close to each other in the sky; either linked by gravity so that they orbit each other (binary star) or lying at different distances from Earth (optical double). Apparent separation of stars is given in seconds of arc (").

Ecliptic – The path of the Sun's center on the celestial sphere as seen from Earth.

Elongation – The angular separation of two celestial bodies. For Mercury and Venus the greatest elongation occurs when they are at their most angular distance from the Sun as viewed from Earth.

Galaxy – A mass of up to several billion stars held together by gravity.

Globular Star Cluster – A ball-shaped group of several thousand old stars.

Light Year (ly) – The distance a beam of light travels at 300,000 km/sec in one year.

Magnitude – The brightness of a celestial object as it appears in the sky.

Open Star Cluster – A group of tens or hundreds of relatively young stars.

Opposition – When a celestial body is opposite the Sun in the sky.

Planetary Nebula – The remnants of a shell of gas blown off by a star.

Universal Time (UT) – A time system used by astronomers. Also known as Greenwich Mean Time. USA Eastern Standard Time (for example, New York) is 5 hours behind UT.

Variable Star – A star that changes brightness over a period of time.

CELESTIAL OBJECTS

NORTHERN HEMISPHERE

AUGUST 2017

Skymaps.com

Easily Seen with the Naked Eye

Altair	Aql	•	Brightest star in Aquila. Name means "the flying eagle". Dist=16.7 ly.
Arcturus	Boo	•	Orange, giant K star. Name means "bear watcher". Dist=36.7 ly.
δ Cephei	Cep	◉	Cepheid prototype. Mag varies between 3.5 & 4.4 over 5.366 days. Mag 6 companion.
Deneb	Cyg	•	Brightest star in Cygnus. One of the greatest known supergiants. Dist=1,400±200 ly.
α Herculis	Her	◉	Semi-regular variable. Magnitude varies between 3.1 & 3.9 over 90 days. Mag 5.4 companion.
Vega	Lyr	•	The 5th brightest star in the sky. A blue-white star. Dist=25.0 ly.
Antares	Sco	•	Red, supergiant star. Name means "rival of Mars". Dist=135.9 ly.
Polaris	UMi	◉	The North Pole Star. A telescope reveals an unrelated mag 8 companion star. Dist=433 ly.
Spica	Vir	•	Latin name means "ear of wheat" and shown held in Virgo's left hand. Dist=250 ly.

Easily Seen with Binoculars

M31	And	⌀	The Andromeda Galaxy. Most distant object visible to naked eye. Dist=2.5 million ly.
η Aquilae	Aql	◉	Bright Cepheid variable. Mag varies between 3.6 & 4.5 over 7.166 days. Dist=1,200 ly.
M3	CVn	⊕	Easy to find in binoculars. Might be glimpsed with the naked eye.
μ Cephei	Cep	◉	Herschel's Garnet Star. One of the reddest stars. Mag 3.4 to 5.1 over 730 days.
χ Cygni	Cyg	◉	Long period pulsating red giant. Magnitude varies between 3.3 & 14.2 over 407 days.
M39	Cyg	◌	May be visible to the naked eye under good conditions. Dist=900 ly.
ν Draconis	Dra	◉	Wide pair of white stars. One of the finest binocular pairs in the sky. Dist=100 ly.
M13	Her	⊕	Best globular in northern skies. Discovered by Halley in 1714. Dist=23,000 ly.
M92	Her	⊕	Fainter and smaller than M13. Use a telescope to resolve its stars.
ε Lyrae	Lyr	◉	Famous Double Double. Binoculars show a double star. High power reveals each a double.
R Lyrae	Lyr	◉	Semi-regular variable. Magnitude varies between 3.9 & 5.0 over 46.0 days.
M12	Oph	⊕	Close to the brighter M10. Dist=18,000 ly.
M10	Oph	⊕	3 degrees from the fainter M12. Both may be glimpsed in binoculars. Dist=14,000 ly.
IC 4665	Oph	◌	Large, scattered open cluster. Visible with binoculars.
6633	Oph	◌	Scattered open cluster. Visible with binoculars.
M15	Peg	⊕	Only globular known to contain a planetary nebula (Mag 14, d=1"). Dist=30,000 ly.
M8	Sgr	□	Lagoon Nebula. Bright nebula bisected by a dark lane. Dist=5,200 ly.
M25	Sgr	◌	Bright cluster located about 6 deg N of "teapot's" lid. Dist=1,900 ly.
M22	Sgr	⊕	A spectacular globular star cluster. Telescope will show stars. Dist=10,000 ly.
M4	Sco	⊕	A close globular. May just be visible without optical aid. Dist=7,000 ly.
M6	Sco	◌	Butterfly Cluster. 30+ stars in 7x binoculars. Dist=1,960 ly.
M7	Sco	◌	Superb open cluster. Visible to the naked eye. Age=260 million years. Dist=780 ly.
M5	Ser	⊕	Fine globular star cluster. Telescope will reveal individual stars. Dist=25,000 ly.
Mizar & Alcor	UMa	◉	Good eyesight or binoculars reveals 2 stars. Not a binary. Mizar has a mag 4 companion.
Cr 399	Vul	◌	Coathanger asterism or "Brocchi's Cluster". Not a true star cluster. Dist=218 to 1,140 ly.

Telescopic Objects

7009	Aqr	✧	Saturn Nebula. Requires 8-inch telescope to see Saturn-like appendages.
ε Boötis	Boo	◉	Red giant star (mag 2.5) with a blue-green mag 4.9 companion. Sep=2.8". Difficult to split.
M94	CVn	⌀	Compact nearly face-on spiral galaxy. Dist=15 million ly.
M51	CVn	⌀	Whirlpool Galaxy. First recognised to have spiral structure. Dist=25 million ly.
M64	Com	⌀	Black-Eye Galaxy. Discovered by J.E. Bode in 1775 - "a small, nebulous star".
Albireo	Cyg	◉	Beautiful double star. Contrasting colours of orange and blue-green. Sep=34.4".
61 Cygni	Cyg	◉	Attractive double star. Mags 5.2 & 6.1 orange dwarfs. Dist=11.4 ly. Sep=28.4".
γ Delphini	Del	◉	Appear yellow & white. Mags 4.3 & 5.2. Dist=100 ly. Struve 2725 double in same field.
β Lyrae	Lyr	◉	Eclipsing binary. Mag varies between 3.3 & 4.3 over 12.940 days. Fainter mag 7.2 blue star.
M57	Lyr	✧	Ring Nebula. Magnificent object. Smoke-ring shape. Dist=4,100 ly.
M23	Sgr	◌	Elongated star cluster. Telescope required to show stars. Dist=2,100 ly.
M20	Sgr	□	Trifid Nebula. A telescope shows 3 dust lanes trisecting nebula. Dist=5,200 ly.
M21	Sgr	◌	A fine and impressive cluster. Dist=4,200 ly.
M17	Sgr	□	Omega Nebula. Contains the star cluster NGC 6618. Dist=4,900 ly.
M11	Sct	◌	Wild Duck Cluster. Resembles a globular through binoculars. V-shaped. Dist=5,600 ly.
M16	Ser	□	Eagle Nebula. Requires a telescope of large aperture. Dist=8,150 ly.
M81	UMa	⌀	Beautiful spiral galaxy visible with binoculars. Easy to see in a telescope.
M82	UMa	⌀	Close to M81 but much fainter and smaller.
M27	Vul	✧	Dumbbell Nebula. Large, twin-lobed shape. Most spectacular planetary. Dist=975 ly.

PROVING GROUND WAIVER AND RELEASE OF CLAIMS

Thank you for visiting our Proving Ground. We certainly hope you enjoy your visit. We want to make your visit is a safe one. Please follow all the written rules and warnings and please strictly follow the direction of designated hosts.

To minimize the risk of injury during the tour, we require visitors to adhere to the safety guidelines and expectations shared by the facility, including the designated age requirement.

The use of cameras (or any other recording device) and cell phones while on the tour is prohibited. Please do not text or send social media messages during the tour.

No backpacks, purses, fanny packs or other containers may be brought into the plant areas (garages / work areas) except to accommodate special requests (for medical reasons, etc.)

Please consider the safety and comfort of other guests during your visit. GM reserves the right to deny access or remove any visitor for failure to follow safety rules, security policies or any other reason.

We ask that you acknowledge the following:

- You were warned at here are hazards inherent in the operation of this facility
- You agree to comply with GM's safety, security and directions for the entire time you are on the premises
- You agreed to stay within defined travel paths and to adhere to any warnings, postings, barriers or guards
- You will not enter into any work space unless expressly invited by the GM tour leader

Finally, we ask that you agree to the following waiver:

As a condition to my being permitted into the site, on behalf of both myself and my party, I hereby release the General Motors LLC and its employees, for ourselves, heirs, representatives, executors, and assigns, from any / or all liability whatsoever that may arise from any injury, damage, and / or loss which we may suffer while in or on GM premises.

I have read, understand, and accept the terms of this tour form and release and waiver:

Signed:_____

Print Name:_____

Parent or Guardian's Signature for those under 18:_____

Date:_____