L.A.S.
Lima Astronomical Society

STAR GAZER

Night Sky Network
Astronomy clubs bringing the wonders of the universe to the public

Member of the Astronomical League and the NASA Night Sky Network

August 2022

Lima Astronomical Society • PO Box 201 • Lima, OH 45802

Schoonover Observatory • 670 N. Jefferson St. • Lima, OH 45801

SOCIETY NEWS AND EVENTS

Upcoming Events

MONTHLY MEETINGS

Board Meeting – August 5 @ 7:00 p.m.
Members Meeting – August 5 @ 8:00 p.m.
Held at Schoonover Observatory

Program / Observing

The 2022 Summer Viewing Program continues every Friday night at dusk, weather permitting.

PERSEID METEOR SHOWER OBSERVING

AUGUST 12 @ 9:00 PM
KENDRICK WOODS METRO PARK

Join the Lima Astronomical Society and the Johnny Appleseed Metropolitan Park District for the annual Perseids Meteor Shower.

Telescopes will be setup for observing objects other then meteors. Information on the Lima Astronomical Society, Schoonover Observatory, and memberships will be available. We appreciate your tax deductible donations.

Lawnchairs, a light jacket, and bug spray is highly recommended. This event is weather-dependent. Check the Lima Astronomical Society Facebook page for weather cancellation.

SUMMER MOON FESTIVAL - RECAP

The club was at the Armstrong Air & Space Museum in Wapakoneta on July 16 to take part in the Summer Moon Festival. The clouds parted throughout the day to allow for some solar observing, and we enjoyed the diversity of visitors at our booth. Unfortunately, Sunday brought rain…all day! Due to the inclement weather, the celebration ended early and events for Sunday were cancelled.

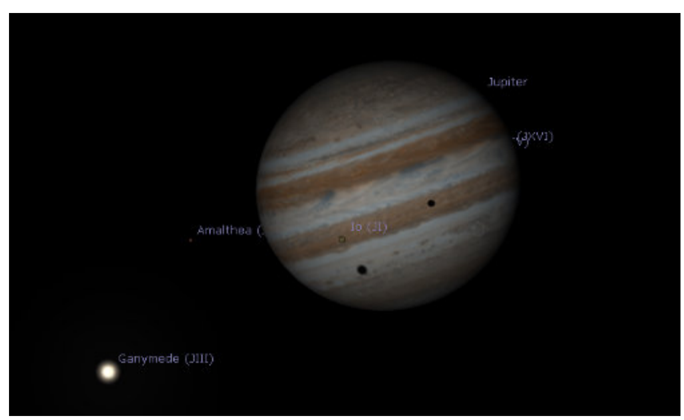
Under the Dome

The State budget was approved and the $250,000 in requested funds has been received by the City of Lima. The next phase will be project planning and working with the City of Lima to bring them to completion. The Society has several projects already on the wish list that will help develop and improve Schoonover Observatory.

The Summer Viewing Program has been going strong. We've had many wonderful visitors and have had some very good views of objects in the Summer sky. The planets were hiding in the early-morning hours for all of June and most of July.

Saturn and Jupiter are now both above the horizon before midnight, and will continue to make earlier appearances throughout the season. Mars will continue to be an early-morning object, remaining below the horizon until after midnight all month long.

This month, Jupiter will have two double shadow transits! The most visible transit for our area will be on August 15 beginning around 11:30pm and ending near 3:00am on August 16. Jupiter's moons Io and Ganymede will cross in front of the planet casting shadows on the planet's surface.



Visit us on the web: LimaAstro.com

Follow us on Facebook: Lima Astronomical Society

This edition of the *Star Gazer* was compiled by Joshua Crawford.
Please forward comments, suggestions, or to unsubscribe/subscribe to this newsletter to crajos@gmail.com.

SHOEMAKER-LEVY 9 IMPACT ON JUPITER 28 YEARS AGO

EarthSky.org

Twenty-eight years ago, between July 16 and 22, 1994, many earthly observers looked on as Comet Shoemaker-Levy 9 (SL9) struck the giant planet Jupiter. Astronomers saw the comet leave visible scars that lingered for months on Jupiter's cloudtops. This spectacular event was the first real-time observation of an extraterrestrial collision in our solar system. People around the world followed it. Scientists later learned that the comet supplied water to Jupiter's atmosphere. According to recent studies, the water is still there today.

Astronomers Carolyn Shoemaker, her husband Eugene Shoemaker, and David Levy discovered SL9 orbiting Jupiter on March 24, 1993. It was the first comet observed orbiting a planet rather than the sun. Orbital studies showed that the comet passed within Jupiter's Roche limit in July 1992. The planet's tidal forces pulled the comet apart into (at least) 21 fragments.

Astronomers soon learned that SL9's orbit would pass within Jupiter in July 1994. Then, the comet would collide with the giant planet near 44° south latitude.

And so it did. What a spectacular event!

Water from Shoemaker-Levy 9

Astronomers observed the SL9 impact and its subsequent scars on Jupiter for weeks. But SL9's chemical impact on Jupiter's atmosphere lasted much longer. Comets are icy bodies. And scientists observed emission from water vapor during the fireball phase of the SL9 impacts. Later, in 1997, the ESA Infrared Space Observatory detected water vapor in the stratosphere of Jupiter. At that time, because comets do tend to be water-rich bodies, astronomers suspected that it might be a consequence of the SL9 impact.

But there were other possible sources of the observed water: for example, interplanetary dust particles produced by cometary activity and asteroid collisions, icy rings, or one of the 79 Jovian satellites.

Then, in 2013, Thibault Cavalié and his colleagues observed Jupiter with the ESA Herschel Space Observatory, which is sensitive enough to map the abundance of water versus latitude and altitude in the Jovian stratosphere. These observations, which they published in the peer-reviewed journal Astronomy and Astrophysics, showed more water in the south, especially near 44° south latitude, where the comet fragments had hit.

Hubble Space Telescope composite image of Jupiter and tiny Shoemaker-Levy 9, as the little comet headed for impact with the giant planet in 1994. Image via NASA/ ESA/ H. Weaver and E. Smith (STScI)/ and J. Trauger and R. Evans (Jet Propulsion Laboratory).

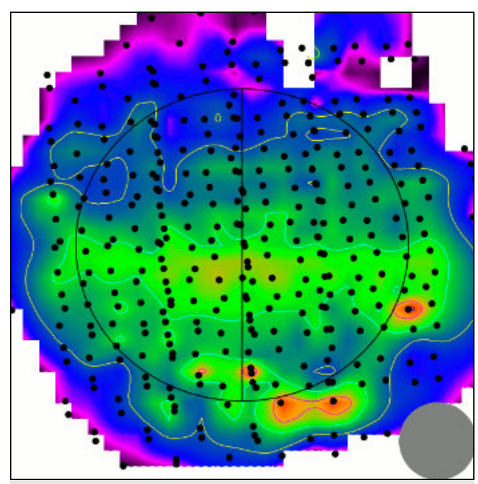
These results indicated that 95% of the water they'd observed on Jupiter came from the comet.

It's been quite a few years since that first study. But the water is still there. A second study from 2019 and published in 2020 shows that the abundance of water still resides on Jupiter as a result of the Comet Shoemaker-Levy 9 collision.

Impacts on Jupiter continue

Today, we know that impacts continue to occur on Jupiter from time to time, but nothing as large as the SL9 event.

A March 5, 1979, event was one of two seen from a space probe. The Voyager team had observed it on the night side of the planet; it appeared as a brief flash. A very small object



This graph shows the abundance of water in Jupiter's stratosphere. The green and red areas correspond to the highest abundances, with more in the southern hemisphere. Image via [Astronomy and Astrophysics]().

caused the 1979 event. It's thought to have been only 24 pounds (11 kg) and only 5.5 inches (0.14 meter) in size.

A July 19, 2009, event is the only impact beside Shoemaker-Levy 9 that left a scar in Jupiter's clouds. In this instance no one saw a flash or the impact. The impact might have occurred on the back side of Jupiter. Witnesses only saw the dark gash as a result of an impacting object.

The Juno spacecraft team noted an impact of a small object on April 10, 2020, on the nighttime side of Jupiter. The team estimated the object was 3 to 13 feet (1 to 4 meters) in diameter.

Amateur astronomers discovered the remaining impacts. Each appeared as a short-duration flash, lasting 1 to 4 seconds. Only one, the 2012 impact, was observed visually. The remainder were captured with astro-imaging.

How to observe impacts

So, you might be asking yourself: How did they catch these impacts? Can I accomplish the same feat?

Amateur astronomers who catch impacts on Jupiter do so by imaging – or recording video of – the planet through a telescope. Telescopes used to accomplish this capture so far have had apertures of 4 inches (12 cm) through 15 inches (37 cm), with a median of about 8 inches (20 cm). The number of frames per second is from 15 through 90. So how do these amateur astronomers scan each of these frames?

Most don't. They are gathering these images so that a software program can remove the blurry ones (the blurriness caused by turbulence in our atmosphere) from the good ones. Then they stack the good ones to produce a beautiful image of Jupiter.

So quite often they have missed impacts. But if they know when the impact occurred, they can go back through their images and find it.

Nowadays, there is some software that will look through the thousands of images for the impact flashes. You can learn more from the users of the software here.

Impacts throughout the solar system

Craters are also occasionally formed on our neighboring planet Mars. But any impacts bright enough to be visible from Earth would be rare, perhaps one every 80 years. Some amateur astronomers also monitor Saturn. But so far, they haven't seen any flashes. Any planet flashes you are likely to see will likely be on Jupiter.

Comets and asteroids hit Jupiter more than your average planet. It is larger than any other planet and has a larger surface area, but the main culprit is that it has massive gravity. It's also located in a part of the solar system where asteroids and comets travel slowly. This gives Jupiter time to bring them in for a hard landing.

You might be thinking that with an automated telescope you can image Jupiter for thousands of hours per year. But that's not as easy as it would seem. If imaging can take place only when your sky is dark, and when Jupiter is at least 20 degrees above your horizon, and the sky is clear and the air is steady, then we're imaging Jupiter only about 10% to 15% of the time. This amounts to no more than 1,000 hours per year.

Nevertheless, it takes only 5 seconds to record an impact. So go for it!

Bottom line: The impact of Comet Shoemaker-Levy 9 into Jupiter in July 1994 has left a lasting impression. Asteroids and comets continue to hit Jupiter, the largest planet in our solar system.

#	Date	Size (M)	Discoverers
1	March 5, 1979	0.14	Voyager Team
2	July 16-22, 1994	1800	Carolyn Shoemaker, Eugene Shoemaker, David Levy
3	July 19, 2009	200-500	Anthony Wesley
4	June 3, 2010	13	Anthony Wesley
5	August 20, 2010	10	Masayuki Tachikawa, Aoki Kazuo
6	September 10, 2012	30	Dan Peterson
7	March 17, 2016	15	Gerrit Kernbauer, John McKeon
8	May 26, 2017	12	Sauveur Pedranghelu
9	August 7, 2019	12-16	Ethan Chappel
10	April 10, 2020	1-4	Juno Team
11	September 13, 2021	15-30	Jose Luis Pereira
12	October 15, 2021	16-32	Ko Arimatsu

Table with impacts of objects with Jupiter over the past 43 years. Table created by Don Machholz.

ARTEMIS 1: A TRIP AROUND THE MOON – AND BACK!

DAVID PROSPER - NIGHT SKY NETWORK

We are returning to the Moon - and beyond! Later this summer, NASA's Artemis 1 mission will launch the first uncrewed flight test of both the Space Launch System (SLS) and Orion spacecraft on a multi-week mission. Orion will journey thousands of miles beyond the Moon, briefly entering a retrograde lunar orbit before heading back to a splashdown on Earth.

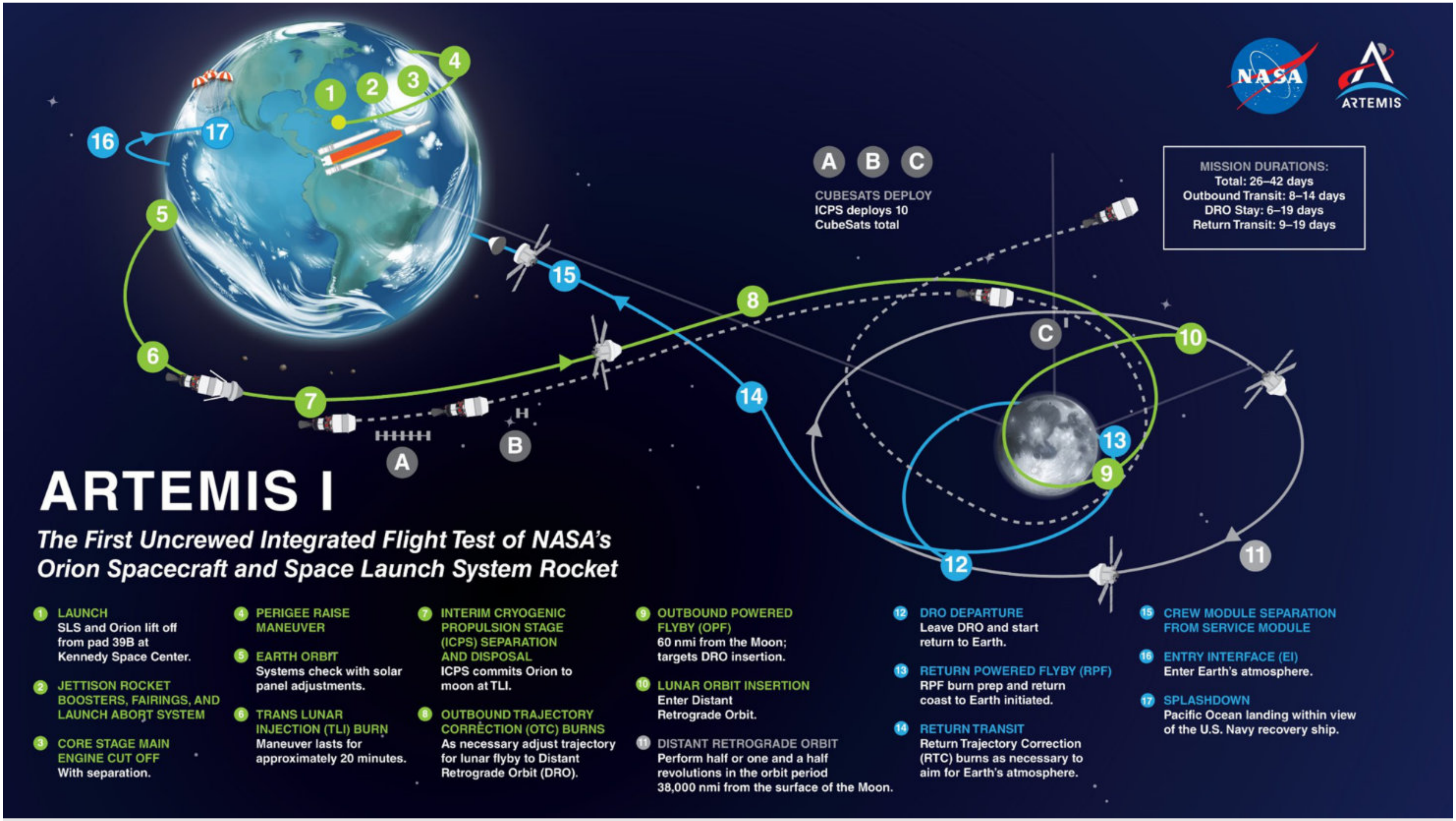
The massive rocket will launch from Launch Complex 39B at the Kennedy Space Center in Florida. The location's technical capabilities, along with its storied history, mark it as a perfect spot to launch our return to the Moon. The complex's first mission was Apollo 10 in 1968, which appropriately also served as a test for a heavy-lift launch vehicle (the Saturn V rocket) and lunar spacecraft: the Apollo Command and Service Modules joined with the Lunar Module. The Apollo 10 mission profile included testing the Lunar Module while in orbit around the Moon before returning to the Earth. In its "Block-1" configuration, Artemis 1's SLS rocket will take off with 8.8 million pounds of maximum thrust, even greater than the 7.6 millions pounds of thrust generated by the legendary Saturn V, making it the most powerful rocket in the world!

Artemis 1 will serve not only as a test of the SLS and the Orion hardware, but also as a test of the integration of ground systems and support personnel that will ensure the success of this and future Artemis missions. While uncrewed, Artemis-1 will still have passengers of a sort: two human torso models designed to test radiation levels during the mission, and "Commander Moonikin Campos," a mannequin named by the public. The specialized mannequin will also monitor radiation levels, along with vibration and acceleration data from inside its mission uniform: the Orion Crew Survival Suit, the spacesuit that future Artemis astronauts will wear. The "Moonikin" is named after Arturo Campos, a NASA electrical engineer who played an essential role in bringing Apollo 13's crew back to Earth after a near-fatal disaster in space.

The mission also contains other valuable cargo for its journey around the Moon and back, including CubeSats, several space science badges from the Girl Scouts, and microchips etched with 30,000 names of workers who made the Artemis-1 mission possible. A total of 10 CubeSats will be deployed from the Orion Stage Adapter, the ring that connects the Orion spacecraft to the SLS, at several segments along the mission's path to the Moon. The power of SLS allows engineers to attach many secondary "ride-along" mission hardware like these CubeSats, whose various missions will study plasma propulsion, radiation effects on microorganisms, solar sails, Earth's radiation environment, space weather, and of course, missions to study the Moon and even the Orion spacecraft and its Interim Cryogenic Propulsion Stage (ICPS)!

If you want to explore more of the science and stories behind both our Moon and our history of lunar exploration, the Night Sky Network's Apollo 11 at 50 Toolkit covers a ton of regolith: bit.ly/nsnmoon! NASA also works with people and organizations around the world coordinating International Observe the Moon Night, with 2022's edition scheduled for Saturday, October 1: moon.nasa.gov/observe. Of course, you can follow the latest news and updates on Artemis 1 and our return to the Moon at nasa.gov/artemis-1

Full Moon over Artemis-1 on July 14, 2022, as the integrated Space Launch System and Orion spacecraft await testing.
Photo credit: NASA/Cory Huston Source: https://www.nasa.gov/image-feature/a-full-moon-over-artemis/

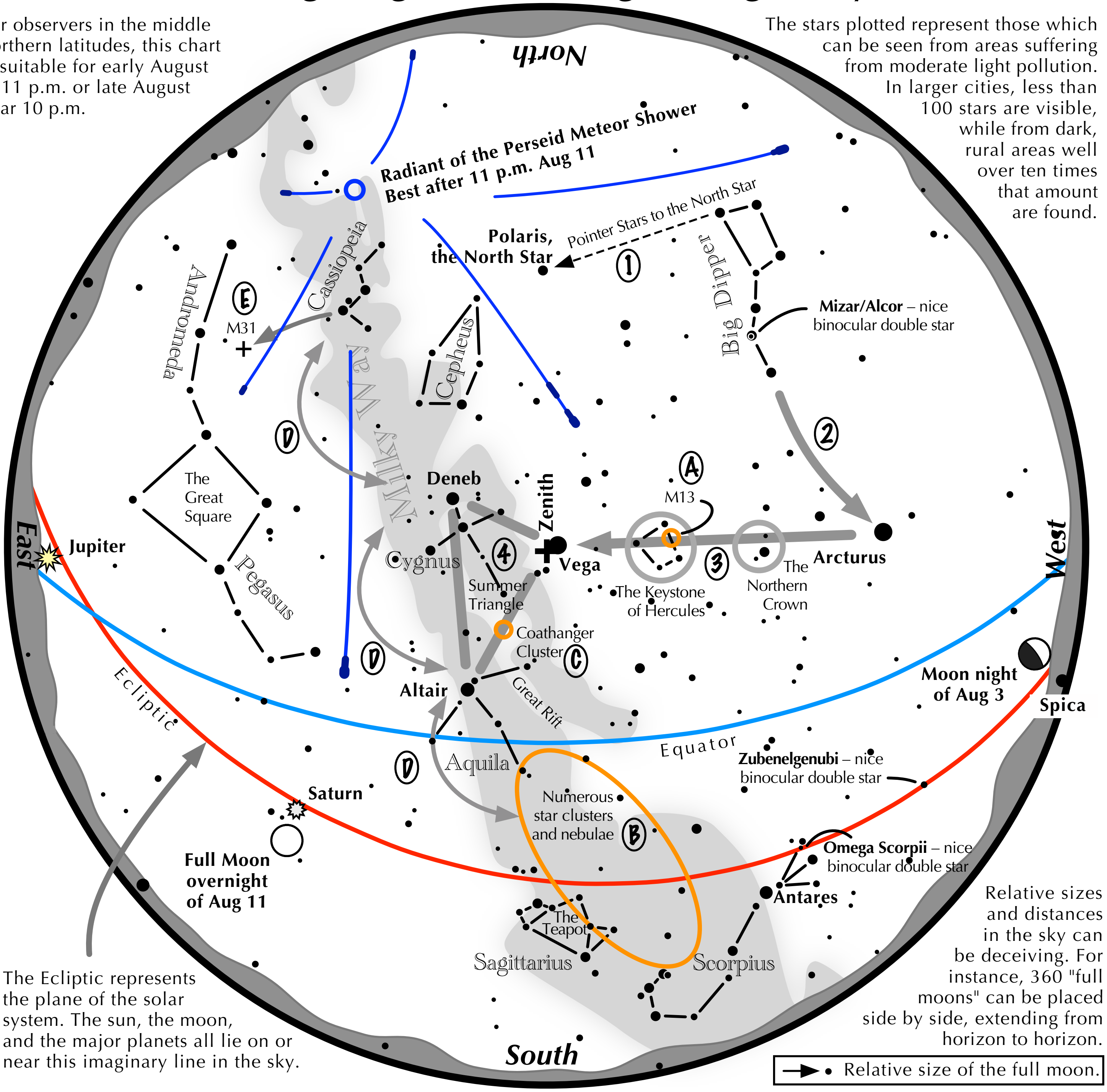


Follow along as Artemis 1 journeys to the Moon and back! A larger version of this infographic is available from NASA at: nasa.gov/image-feature/artemis-i-map

Navigating the mid August Night Sky

For observers in the middle northern latitudes, this chart is suitable for early August at 11 p.m. or late August near 10 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

Relative size of the full moon.

Navigating the mid August night sky: Simply start with what you know or with what you can easily find.

1. Extend a line north from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
2. Follow the arc of the Dipper's handle. It intersects Arcturus, the brightest star in the June evening sky.
3. To the northeast of Arcturus shines another star of the same brightness, Vega. Draw a line from Arcturus to Vega. It first meets "The Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
4. High in the East lies the summer triangle stars of Vega, Altair, and Deneb.

Binocular Highlights

A: On the western side of the Keystone glows the Great Hercules Cluster.
B: Between the bright stars Antares and Altair, hides an area containing many star clusters and nebulae.
C: 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger.
D: Sweep along the Milky Way for an astounding number of faint glows and dark bays, including the Great Rift.
E: The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval.

Astronomical League *www.astroleague.org/outreach; duplication is allowed and encouraged for all free distribution.*

OBSERVING LISTS

Top ten deep-sky objects for August	
M8	M22
M11	M24
M16	M27
M17	M55
M20	M57

Top ten deep-sky binocular objects for August	
Cr 399	M22
IC 4756	M24
M8	M25
M11	M27
M17	NGC 6633

Challenge deep-sky object for August
Abell 53
Abell 53 is a planetary nebula located in the constellation Aquila. You'll need decent skies and a fairly large telescope to spot it through an eyepiece. Apparent Magnitude: 16.9 Surface Brightness: 15.0

THIS MONTH IN ASTRONOMY

- The gibbous phase of Mars was first observed by Francesco Fontana on August 24, 1638.
- Abraham Ihle discovered the globular cluster M22 on August 26, 1665.
- Nicolas Sarabat discovered Comet C/1729 P1 (Sarabat) on August 1, 1729.
- Caroline Herschel discovered Comet C/1786 P1 (Herschel) on August 1, 1786.
- The Saturnian satellite Enceladus was discovered by William Herschel on August 28, 1789.
- Dominique Dumouchel was the first person to observe the return of Comet 1P/Halley on August 5, 1835.
- John Russell Hind discovered asteroid 7 Iris on August 13, 1847.
- Asaph Hall discovered Deimos on August 11, 1877 and Phobos on August 17, 1877.
- The first extragalactic supernova, S Andromedae, was discovered by Ernst Hartwig on August 20, 1885.
- David Jewitt and Jane Luu discovered the trans-Neptunian object (15760) 1992 QB1 on August 30, 1992.
- The Jovian satellite 2002 Laomedeia was discovered by Matthew Holman on August 13th, 2002.

THE CARINA NEBULA. CAPTURED BY THE JAMES WEBB SPACE TELESCOPE'S NIRCAM (NEAR-INFRARED CAMERA). ONE OF FIVE "FIRST LIGHT" IMAGES RELEASED BY NASA.

August 2022 Astronomy Events Calendar

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
	1 **Mars 1.4° S of Uranus**	2 Venus at ascending node	3	4 **Mercury 0.7° N of Regulus**	5 **LAS Meeting @ 8pm** **Summer Viewing Program** **First quarter Moon**	6
7	8	9 **Double shadow transit on Jupiter**	10 Moon at perigee	11	12 **Summer Viewing Program** **Perseid Meteors @ Kendrick Woods** **Full Moon**	13 **Perseid Meteors Peak** Mercury at descending node
14 **Saturn at opposition** Neptune 3° N of Moon	15 **Jupiter 1.9° N of Moon**	16 **Double shadow transit on Jupiter**	17	18 **Uranus 0.6° S of Moon**	19 **Summer Viewing Program** **Last quarter Moon** Mars 3° S of Moon	20
21	22 Vesta at opposition Moon at apogee	23 Mercury at aphelion	24 Uranus stationary	25 **Ceres 0.7° N of Moon** **Venus 4° S of Moon**	26 **Summer Viewing Program**	27 **New Moon** **Mercury greatest elongation E**
28	29	30	31			