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
September 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 – September 2 @ 7:00 p.m.
Members Meeting – September 2 @ 8:00 p.m.
Held at Schoonover Observatory

Program / Observing

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

ANNOUNCEMENTS

The 2023 Observer's Handbook is now available for pre-order from the Astronomical League. The Handbook is essentially an almanac that contains just about every piece of information an astronomer could want for the entire year.

Click on this link to visit the League store for the *Handbook*. The club has a copy of the 2022 edition if you want to review a copy before you buy. Stop by the observatory on Friday nights.

NASA scrubbed the launch of the Artemis I mission on Monday, August 29, due to a fuel leak. The leak is located in the same location of one that was identified during pre-launch checks several days before.

Schoonover Observatory was open at 8:00 a.m. on August 29 so members and the public could view the launch together. Unfortunately the event did not last long due to the scrubbed launch, but thank you to all who attended.

The launch may be rescheduled as soon as September 2. Schoonover Observatory will not likely open for the launch as the Summer Viewing Program is occurring later that night. Maybe we will get lucky and have a nighttime launch!

SPECIAL ANNOUNCEMENT: OBSERVATORY BURGLARY

Many of you may have already heard the bad news. We are sad to announce a break-in at Schoonover Observatory sometime between the August 19 and August 26 Summer Viewing Programs. Many items of value and importance to the club were taken.

Missing are the primary telescope from the dome, the 14" Celestron C14, and all the finder scopes and accessories that were attached to it. The full complement of eyepieces used with the telescope are also missing, as well as a few mounting knobs for the mount that secure the telescope.

President Michael Ritchie and life-member, David Humphreys, arrived at Schoonover Observatory on the evening of Friday, August 26 to open the observatory for the weekly Summer Viewing Program. They found the door to the dome wide open and the equipment missing.

This is a heartfelt loss for the club and the many individuals who have enjoyed observing through that telescope all these years with the Society. The Society Board is investigating fundraising options to subsidize replacement equipment.

In the meantime, the Summer Viewing Program will continue as planned, albeit with some alternate equipment.

The Society needs member support and volunteers now more than ever. A small group of regular members host observatory and public outreach events, manage the business of the club, spearhead fundraising initiatives, network, develop new projects, and more.

The more active members that help out, the more Lima Astro can grow; with members and the public benefiting from what the Society has to offer.

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.

BETELGEUSE'S GREAT DIMMING: THE AFTERMATH

SkyAndTelescope.org

The Great Dimming occurred when Betelgeuse coughed out a huge chunk of material, and the ejection took a toll on the giant star.

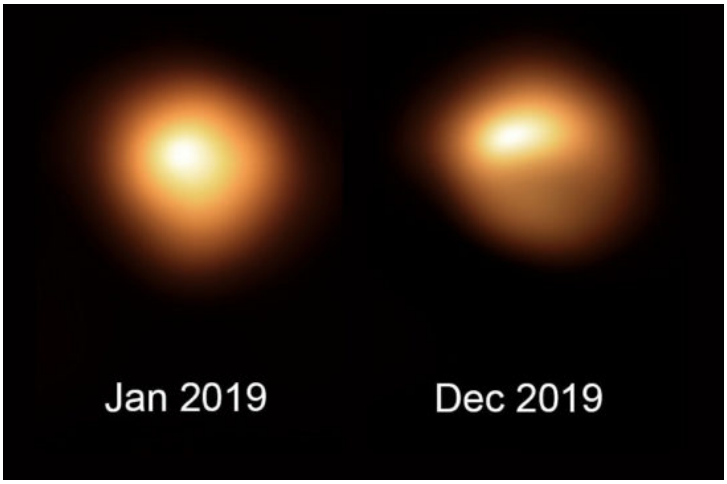
Side-by-side photos taken with the same exposure under the same conditions show the dramatic change Betelgeuse underwent during its Great Dimming. The photo at left was taken in February 2016, the one on the right on December 31, 2019, when the star was approaching the deep minimum.

Courtesy of Brian Ottum and EarthSky

An international team of astronomers has revealed why the star Betelgeuse famously dimmed back in 2019. The dying star coughed out a huge chunk of material weighing several times more than the Moon, which then blocked out some of its light.

Betelgeuse is the 10th brightest star in the night sky and marks Orion's right shoulder (his left shoulder from our point of view). It is a red supergiant, an engorged monster that would stretch out to the orbit of Jupiter if it replaced the Sun in our solar system. Betelgeuse is well on its way to ending its life by detonating as a cataclysmic supernova; meanwhile, astronomers get unprecedented insight into a giant star's final stages.

The situation became more intriguing in late 2019 when Betelgeuse mysteriously dropped in brightness, an event that came to be known as The Great Dimming. The fading was pronounced enough, more than a magnitude, to notice even with the unaided eye. Lots of possible explanations have been mooted, but now a team led by Andrea Dupree (Center for Astrophysics, Harvard & Smithsonian) thinks they know what happened.



This comparison image shows dramatic changes as Betelgeuse underwent unprecedented dimming. The observations, taken with the SPHERE instrument on ESO's Very Large Telescope in January and December 2019, reveal that the bottom half of the star had dimmed.

ESO / M. Montargès et al.

By piecing together data from a slew of telescopes, including the Hubble Space Telescope, Dupree is pointing the finger at an event called a Surface Mass Ejection (SME). Our own Sun regularly burps material from its corona, ejecting a billion tonnes of solar material — about the mass of Mount Everest. But Betelgeuse's SME spit out 400 billion times more material, equivalent to several times more mass than the Moon. As the ejected material cooled, it formed a cloud of dust that partially blocked, and thus dimmed, our view of Betelgeuse.

"We've never before seen a huge mass ejection of the surface of a star," Dupree says. "We are left with something going on that we don't completely understand."

The likely cause of the upheaval was a giant plume inside the star that measured a million miles across — four times the distance between Earth and the Moon. It bubbled up to the surface, causing shocks and pulsations that threw material into space. Betelgeuse's bloated size made the effects more pronounced; its surface gravity is 10,000 times weaker than the Sun's.

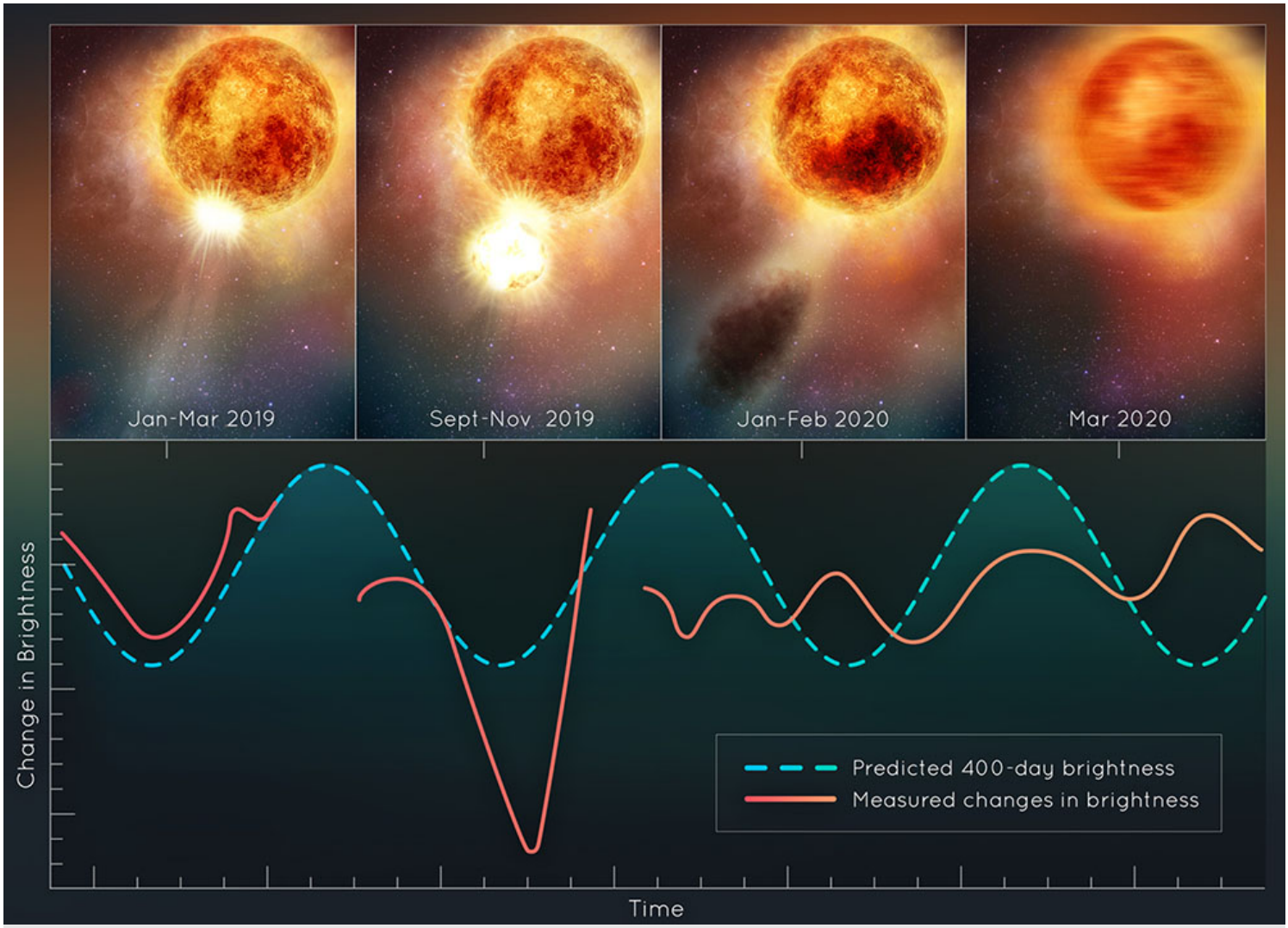
The event seems to have had a profound effect on Betelgeuse's more regular pulsations. Astronomers have observed the star for centuries and noticed that it goes through cycles of brightness variations with a period of 400 days. This pattern seems to have completely disap-

peared since The Great Dimming, perhaps as result of a reshuffling of material in the star's interior. "Betelgeuse continues doing some very unusual things right now," Dupree says.

"These observations allow us to watch . . . as a giant star re-adjusts and settles down after a huge disturbance," says Thomas Baumgarte (Bowdoin College), who was not involved in the research. "This is truly a unique opportunity, with lots of potential to advance our understanding of these stars."

Emily Cannon (KU Leuven, Belgium), also not involved in the work, says the process must be put into context. "Red supergiants exhibit powerful mass loss, expelling the entire mass of our Sun into the interstellar environment over a timespan of 10,000 to 1 million years," she says. "While still contributing to the overall mass loss, this single event ejecting approximately 0.000001 solar masses is not a lot for these type of stars."

We have never witnessed an event like this before, but that doesn't mean it's uncommon. After all, as Dupree says, we're now "watching stellar evolution in real-time."



This illustration plots changes in the brightness of the red supergiant star Betelgeuse (bottom), following the titanic mass ejection of a large piece of its visible surface (artist's concept at top). The rightmost frame shows vibrations that might be jiggling the star's interior as it readjusts.

NASA / ESA / Elizabeth Wheatley (STScI)

WEBB AND HUBBLE SEE THE UNIVERSE DIFFERENTLY

EarthSky.org

Combined views from Webb and Hubble

The European Space Agency (ESA) released these images of M74 – aka the Phantom Galaxy – on August 29, 2022. On the left, you see a Hubble Space Telescope image. On the right, you see a James Webb Space Telescope image. The center image is a composite, created by combining Hubble's optical data with Webb's mid-infrared data.

M74, the Phantom Galaxy

The Phantom Galaxy – Messier 74 or M74 – is around 32 million light-years away from Earth in the direction toward our constellation Pisces the Fishes.

It's called the Phantom because the galaxy's surface brightness is low. It's the most difficult to find of all the Messier objects that amateur astronomers observe in small telerscopes. The low surface brightness is due to the fact that the galaxy lies almost face-on to Earth. Yet this orientation in space lets us see the galaxy's two clearly defined spiral arms, which make it an example of a grand design spiral galaxy.

Webb and Hubble comparison. On the left, the Hubble Space Telescope's view of the galaxy M74, aka the Phantom Galaxy, ranges from the older, redder stars toward the center, to younger and bluer stars in its spiral arms, to sites of active star formation in the red bubbles of H II regions. On the right, the James Webb Space Telescope sees at different wavelengths (Webb primarily looks at the universe in the infrared, while Hubble studies it primarily at optical and ultraviolet wavelengths). So the image is strikingly different. Webb's image highlights the masses of gas and dust within the galaxy's arms and the dense cluster of stars at its core. In the center, the 2 images are combined.

Images via Hubble/ Webb/ ESA.

ESA described what you see in the new image:

The red colors mark dust threaded through the arms of the galaxy, lighter oranges being areas of hotter dust. The young stars throughout the arms and the galaxy's core are in blue. Heavier, older stars toward the galaxy's center are cyan and green, projecting a spooky glow from the core of the Phantom Galaxy. Bubbles of star formation are also visible in pink across the arms. It's rare to see such a variety of galactic features in a single image.

Astronomers estimate M74 hosts about 100 billion stars.

Bottom line: A new image of M74 – the Phantom Galaxy – combines data from the Hubble Space Telescope and the James Webb Space Telescope.

THE SUMMER TRIANGLE'S HIDDEN TREASURES

DAVID PROSPER - NIGHT SKY NETWORK

September skies bring the lovely Summer Triangle asterism into prime position after nightfall for observers in the Northern Hemisphere. Its position high in the sky may make it difficult for some to observe its member stars comfortably, since looking straight up while standing can be hard on one's neck! While that isn't much of a problem for those that just want to quickly spot its brightest stars and member constellations, this difficulty can prevent folks from seeing some of the lesser known and dimmer star patterns scattered around its informal borders. The solution? Lie down on the ground with a comfortable blanket or mat, or grab a lawn or gravity chair and sit luxuriously while facing up. You'll quickly spot the major constellations about the Summer Triangle's three corner stars: Lyra with bright star Vega, Cygnus with brilliant star Deneb, and Aquila with its blazing star, Altair. As you get comfortable and your eyes adjust, you'll soon find yourself able to spot a few constellations hidden in plain sight in the region around the Summer Triangle: Vulpecula the Fox, Sagitta the Arrow, and Delphinus the Dolphin! You could call these the Summer Triangle's "hidden treasures" – and they are hidden in plain sight for those that know where to look!

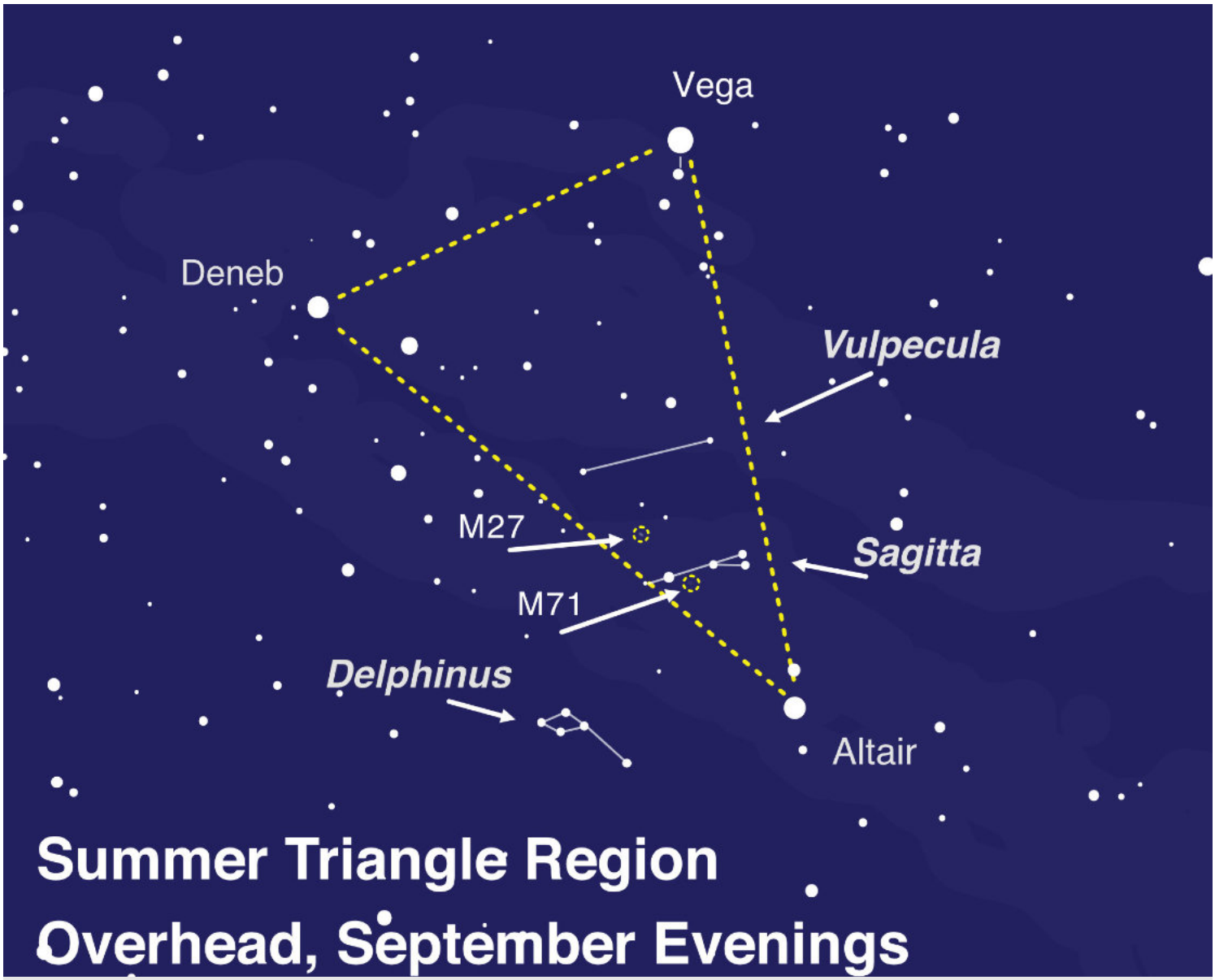
Vulpecula the Fox is located near the middle of the Summer Triangle, and is relatively small, like its namesake. Despite its size, it features the largest planetary nebula in our skies: M27, aka the Dumbbell Nebula! It's visible in binoculars as a fuzzy "star" and when seen through telescopes, its distinctive shape can be observed more readily - especially with larger telescopes. Planetary nebulae, named such because their round fuzzy appearances were initially thought to resemble the disc of a planet by early telescopic observers, form when stars similar to our Sun begin to die. The star will expand into a massive red giant, and its gasses drift off into space, forming a nebula. Eventually the star collapses into a white dwarf – as seen with M27 - and eventually the colorful shell of gasses will dissipate throughout the galaxy, leaving behind a solitary, tiny, dense, white dwarf star. You are getting a peek into our Sun's far-distant future when you observe this object!

Sagitta the Arrow is even smaller than Vulpecula – it's the third smallest constellation in the sky! Located between the stars of Vulpecula and Aquila the Eagle, Sagitta's stars resemble its namesake arrow. It too contains an interesting deep-sky object: M71, an unusually small and young globular cluster whose lack of a strong central core has long confused and intrigued astronomers. It's visible in binoculars, and a larger telescope will enable you to separate its stars a bit more easily than most globulars; you'll certainly see why it was thought to be an open cluster!

Delicate Delphinus the Dolphin appears to dive in and out of the Milky Way near Aquilla and Sagitta! Many stargazers identify Delphinus as a herald of the fainter water constellations, rising in the east after sunset as fall approaches. The starry dolphin appears to leap out of the great celestial ocean, announcing the arrival of more wonderful sights later in the evening.

Want to hunt for more treasures? You'll need a treasure map, and the Night Sky Network's "Trip Around the Triangle" handout is the perfect guide for your quest! Download one before your observing session at bit.ly/TriangleTrip. And of course, while you wait for the Sun to set - or skies to clear - you can always find out more about the objects and science hidden inside these treasures by checking out NASA's latest at nasa.gov.

M71 as seen by Hubble. Your own views very likely won't be as sharp or close as this. However, this photo does show the cluster's lack of a bright, concentrated core, which led astronomers until fairly recently to classify this unusual cluster as an "open cluster" rather than as a "globular cluster." Studies in the 1970s proved it to be a globular cluster after all – though an unusually young and small one! Credit ESA/Hubble and NASA. *Source: https://www.nasa.gov/feature/goddard/2017/messier-71*

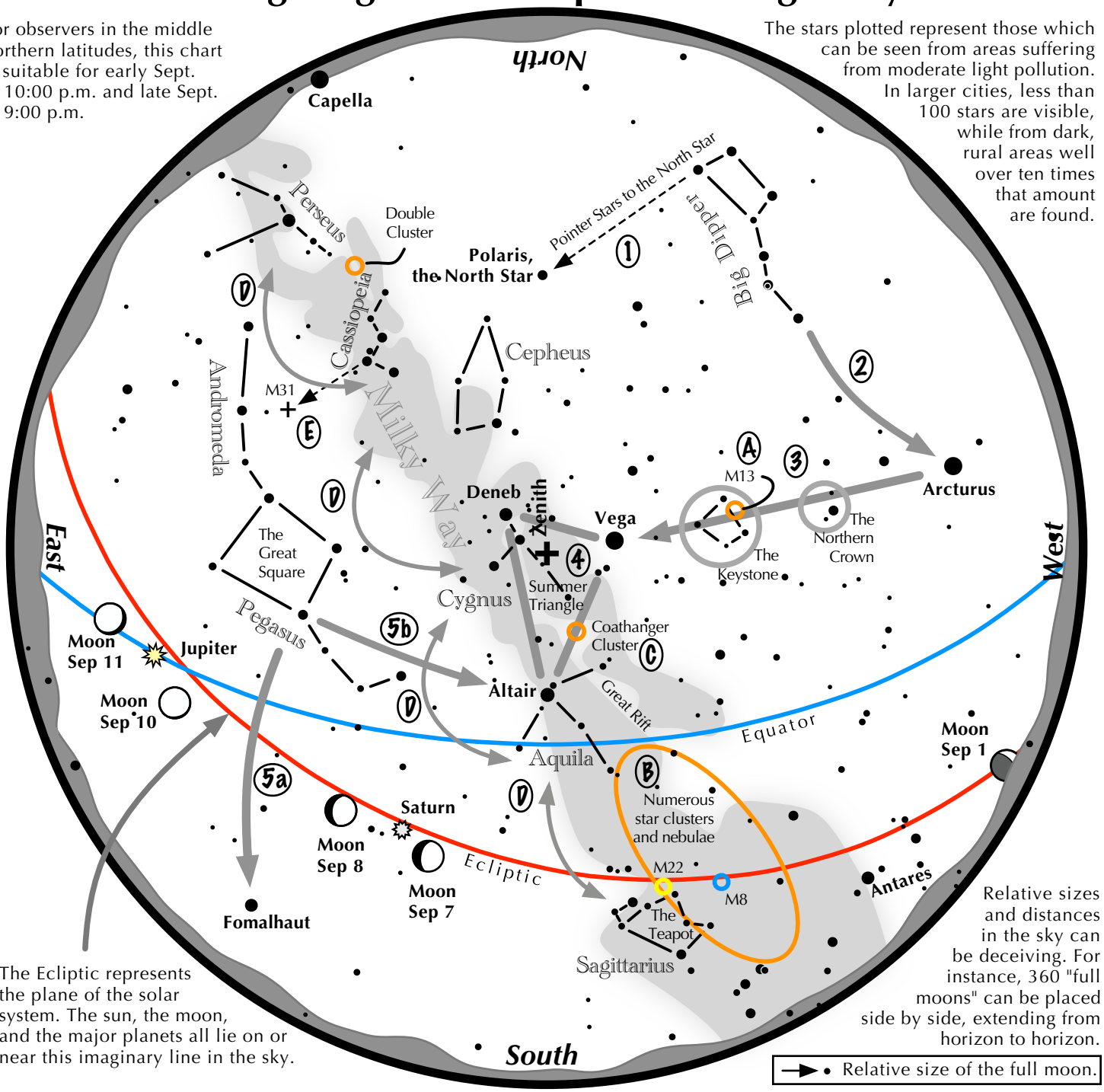


Search around the Summer Triangle to spot some of its hidden treasures! To improve readability, the lines for the constellations of Aquilla, Lyra, and Cygnus have been removed, but you can find a map which includes them in our previous article, Spot the Stars of the Summer Triangle, from August 2019. These aren't the only wonderful celestial sights found around its borders; since the Milky Way passes through this region, it's littered with many incredible deep-sky objects for those using binoculars or a telescope to scan the heavens. *Image created with assistance from Stellarium*

Navigating the mid September Night Sky

For observers in the middle northern latitudes, this chart is suitable for early Sept. at 10:00 p.m. and late Sept. at 9:00 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 September 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 September evening sky.
3. Nearly overhead shines a star of similar brightness as Arcturus, 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. The stars of the summer triangle, Vega, Altair, and Deneb, shine overhead.
5. The westernmost two stars of the Great Square, which lies high in the east, point south to Fomalhaut. The southernmost two stars point west to Altair.

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.

OBSERVING LISTS

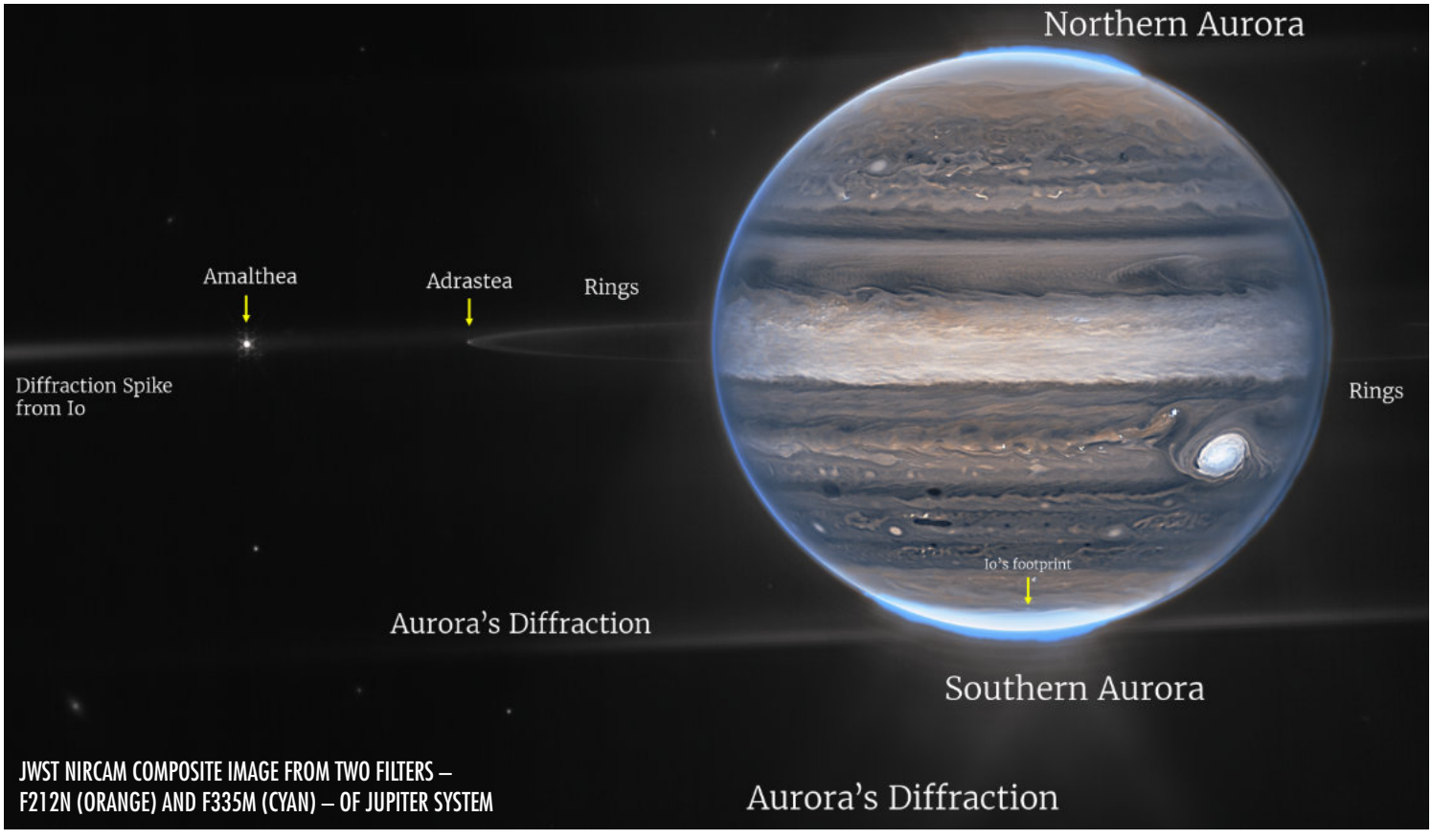
Top ten deep-sky objects for September	
IC 1396	NGC 6946
M2	NGC 6960
M15	NGC 6992
M30	NGC 7000
NGC 6888	NGC 7009

Top ten deep-sky binocular objects for September	
IC 1396	M30
LDN 906	M39
M2	NGC 6939
M15	NGC 6871
M29	NGC 7000

Challenge deep-sky object for September
Abell 78
Abell 78 is a planetary nebula located in Cygnus. It has a fainter halo consisting mostly hydrogen, and an inner elliptical ring that is mostly made of helium. Apparent Magnitude: 17.9 Surface Brightness: 15.0

THIS MONTH IN ASTRONOMY

- Jean-Dominique Maraldi discovered the globular cluster M15 on September 7, 1746.
- On September 11, 1746, Jean-Dominique Maraldi discovered the globular cluster M2.
- Nicolas-Louis de Lacaille discovered NGC 104, the second largest and brightest globular cluster, on September 14th, 1751.
- William Herschel discovered the barred spiral galaxy NGC 7753 on September 12, 1784.
- William Herschel discovered the Saturnian satellite Mimas on September 17, 1789.
- Comet C/1793 S2 (Messier) was discovered by Charles Messier on September 27th, 1793.
- Karl Harding discovered asteroid 3 Juno on September 1, 1804.
- Neptune was discovered by Johann Gottfried Galle on September 23, 1846, using Urbain Le Verrier's calculations of its position.
- On September 19, 1848, William Bond discovered Saturn's fourteenth-magnitude satellite Hyperion, the first irregular moon to be discovered.
- On September 13, 1850, John Russell Hind discovered the asteroid 12 Victoria.
- E. E. Barnard discovered Jupiter's fifth satellite, fourteenth-magnitude Amalthea, using the 36-inch refractor at the Lick Observatory, on September 9, 1892.



JWST NIRCAM COMPOSITE IMAGE FROM TWO FILTERS – F212N (ORANGE) AND F335M (CYAN) – OF JUPITER SYSTEM

September 2022 Astronomy Events Calendar

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
				1	2 **LAS Meeting @ 8pm** **Summer Viewing Program**	3 **First quarter Moon**
4 Venus at perihelion	5 Venus 0.8° N of Regulus	6	7 Juno at opposition Moon at perigee	8 Saturn 4° N of Moon	9 **Summer Viewing Program** Mercury stationary	10 **Full Moon** Neptune 3° N of Moon
11 **Jupiter 1.8° N of Moon**	12	13 Mercury at greatest heliocentric lat. S	14 **Uranus 0.8° S of Moon**	15	16 **Summer Viewing Program** **Neptune at opposition**	17 Mars 4° S of Moon **Last quarter Moon**
18	19 Moon at apogee	20 Pollux 1.9° N of Moon	21	22	23 **Summer Viewing Program** **September Equinox** Mercury in inferior conjunction	24
25 **New Moon**	26 Venus at greatest heliocentric lat. N **Jupiter at opposition**	27	28	29	30	