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

July 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 – July 1 @ 7:00 p.m.
Members Meeting – July 1 @ 8:00 p.m.
Held at Schoonover Observatory

Program / Observing

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

SUMMER MOON FESTIVAL

ARMSTRONG AIR & SPACE MUSEUM
JULY 16-17, 10:00AM – 4:00PM

The club will participate in the Summer Moon Festival at the Armstrong Air & Space Museum in Wapakoneta on:

- Saturday, July 16 from 10 am – 4 pm
- Sunday, July 17 from 10 am – 4 pm

This is a large two-day event the club attends annually. We will have a large tent set up on the lawn in front of the museum with a display of telescopes, with solar viewing if the skies are clear, astronomy handouts and displays, children's activities, and plenty of astronomy talk and education.

While you're there, pick up a Lima Astro t-shirt, or some solar glasses to safely observe the Sun!

This is a great opportunity to "talk shop" about astronomy and astrophotography, mingle with club members, learn something new, and visit the museum while you're there!

Stop by and see us, and bring some friends!

More information can be found online at:

https://www.armstrongmuseum.org/events/community-event/2022-summer-moon-festival

Under the Dome

If you have not yet heard, the Society applied for $250,000 in state funds that would allow much needed improvements at Schoonover Observatory, and potentially be available to assist the Society in constructing the proposed dark sky observatory at Kendrick Woods.

At the June club meeting, President Michael Ritchie announced that he received word that the request for funds was approved in the full amount, pending the approval of the State budget. Wheels are already turning as to the major projects that could be tackled with the funds, such as an expanded parking lot and improved HVAC at Schoonover Observatory.

Membership data was recently transitioned to the Night Sky Network. The Network provides a host of tools for club organizers to improve management of member data and communication with club membership. In addition, this has also provided every active Lima Astro member with a login for the Night Sky Network.

Members should have received an automated email with their login information from the Night Sky Network. If you did not receive this email, or need assistance using the service, send us an email or message on Facebook, and we can help you out.

The 2022 Summer Viewing Program kicked-off on June 3. It has been great to see the dome full of people waiting to get the chance to observe the wide-variety of objects that we can see from Lima, talk with first-time visitors about the Society and Schoonover Observatory, and get the younger generation interested in astronomy.

We hope you come visit often this Summer!

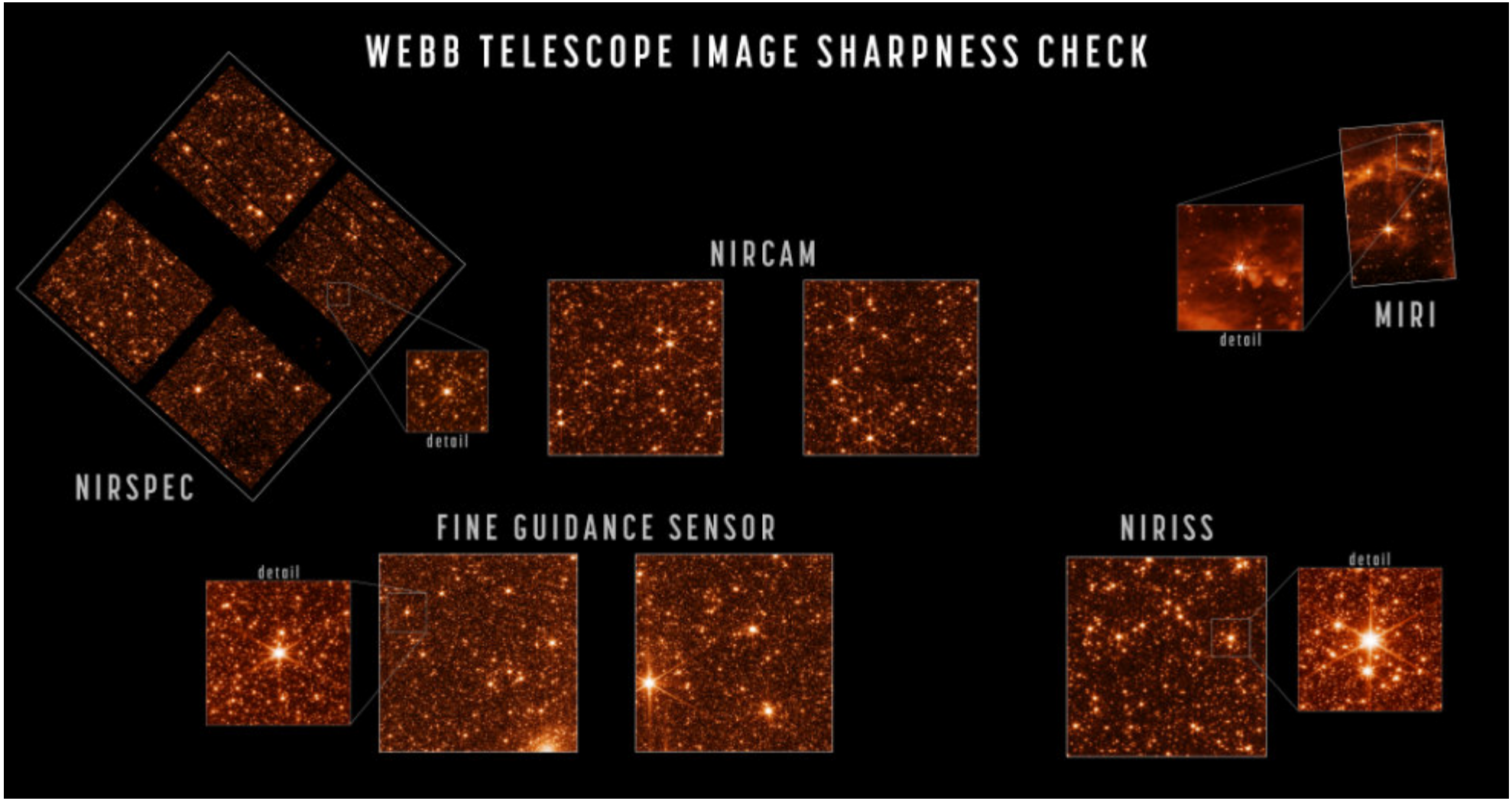
This edition of the *Star Gazer* was compiled by Joshua Crawford.
Please forward comments, suggestions, or to unsubscribe/subscribe to this newsletter to crajos@gmail.com.

COUNTDOWN TO WEBB'S FIRST IMAGES

NASA.GOV

We are counting down to July 12, 2022 when NASA's James Webb Space Telescope, a partnership with ESA (European Space Agency) and the Canadian Space Agency, will release its first full-color images and spectroscopic data.

Early alignment imagery has already demonstrated the unprecedented sharpness of Webb's infrared view. However, these new images will be the first in full color and the first to showcase Webb's full science capabilities. In addition to imagery, Webb will be capturing spectroscopic data – detailed information astronomers can read in light. The first images package of materials will highlight the science themes that inspired the mission and will be the focus of its work: the early universe, the evolution of galaxies through time, the lifecycle of stars, and other worlds. All of Webb's commissioning data – the data taken while aligning the telescope and preparing the instruments – will also be made publicly available.



NEWEST STARLINK SATELLITES HAVE GOTTEN BRIGHTER AGAIN

SkyAndTelescope.org

Changes to the design of Starlink satellite spacecraft have made them brighter again, though still dimmer than the original design.

SpaceX has launched more than 2,000 Starlink internet satellites since 2019, and the company plans to orbit thousands more in the near future. Astronomers are concerned that these megaconstellations of bright spacecraft will seriously interfere with celestial observations for professionals and amateurs alike.

In order to address the problem, SpaceX voluntarily began installing sunshades on their Starlink satellites two years ago. These so-called VisorSats are about 1.3 magnitudes dimmer than the original satellites, as reported in Sky & Telescope. But now, new technological requirements have resulted in visors being omitted from a new generation of Starlink satellites launched since late last year. Alexandra Witze reported in *Nature* that the newest satellites use laser communication instead of radio links; while the sunshades were transparent to radio frequencies, they block laser light.

SpaceX engineer David Goldstein discussed these design changes at a recent webinar organized by the Federation of Astronomical Societies, adding that the company has developed dielectric mirrors for the Earth-facing side of the Starlink chassis, designed to reflect sunlight away from observers directly below the spacecraft.

In order to test how the brightness of the latest Starlink spacecraft (those with ID numbers above 3000) compare to VisorSats, I analyzed magnitudes recorded this year by Jay Respler, an accomplished satellite observer. The average visual magnitude measured for 58 Series-3000 satellites is 5.60, brighter than the average magnitude of 6.29 measured for 44 VisorSats.

Both a satellite's distance from the observer and its angle relative to the Sun influence its brightness. After adjusting the observed magnitudes for these parameters, I found that the Series-3000 spacecraft are about 60% brighter than VisorSats. And even the VisorSat design had still exceeded the 7th-magnitude limit recommended by astronomers to minimize both interference with research and naked-eye enjoyment of the night sky. However, the Series-3000 satellites still represent an improvement of about 0.8 magnitudes compared to the original Starlink satellites.

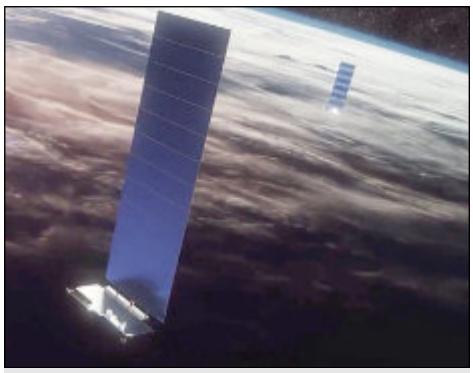
It's worth noting that Starlink satellites can sometimes appear far brighter than mentioned already, shortly after they're launched in batches of 50 or so. One recent sighting was reported by WKBN News in northeast Ohio. Dozens of members of the public alerted the media outlet after seeing a line of bright lights in the sky on the evening of April 21st. Those lights turned out to be Starlink satellites from the group designed G4-14, which had launched earlier that day.

Amateur astronomer, Gus Saikaly, described his view of G4-14 to me and sent the photograph below. He estimated the satellites' individual magnitudes as -3 and likened them to a "string of Jupiters." Such a dazzling train of spacecraft would spoil observations of almost any astronomical object.

In another worrisome development, SpaceX plans an entirely new version of Starlink that's larger than the current model. In this video, SpaceX CEO Elon Musk announced that Starlink 2.0 would be 7 meters long and weighs 1.25 tons. The new model is so large and heavy that it will require a bigger and more powerful rocket than the Falcon 9, which currently launches the satellites. The Starlink 2.0 spacecraft will instead fly on SpaceX's super heavy-lift Starship rocket. While their design will take light reflection into account, these future Starlinks could nevertheless end up exceeding the brightness of current ones.

Astronomers, Unite

Astronomers are not sitting by idly while SpaceX and other space-internet companies such as OneWeb populate the sky with spacecraft. The International Astronomical Union is establishing a Centre for Protection of the Dark and Quiet Sky from Satellite Constellation Interference. This web-based resource, under the management of astronomers Piero Benvenuti, Connie Walker and Federico Di Vruno, will serve as a resource for all stakeholders in the effort to preserve dark skies. The Centre will be a vital hub for astronomers as other entities including Amazon and the Chinese government pursue their own plans for space-based internet infrastructures.



In this conceptual view, each Starlink satellite unfurls a single solar panel.

SpaceX

THE TUNGUSKA EXPLOSION, 114 YEARS AGO

EarthSky.org

On June 30, 114 years ago, the largest asteroid impact in recorded history struck on a warm summer morning in Siberia, Russia. Now, we observe Asteroid Day each year on June 30, on the anniversary of what's now known as the "Tunguska explosion".

The explosion happened over the sparsely populated northern forestland above the Podkamennaya Tunguska River in what is present-day Krasnoyarsk Krai.

Incredibly, the blast released enough energy to kill reindeer and flatten an estimated 80 million trees over an area of 830 square miles (2,150 square km). Witnesses reported seeing a fireball – a bluish light, nearly as bright as the sun – moving across the sky. In addition, a flash and a sound similar to artillery fire was said to follow it. Moreover, a powerful shockwave broke windows hundreds of miles/kilometers away and knocked people off their feet.

Yet, ultimately, decades passed before anyone could explain the event.

Tunguska explosion largest in recorded history

A mysterious aspect of the Tunguska event was that, surprisingly, no one ever found a crater. But, even without a crater, scientists still categorized it as an impact event. They now believe the incoming object never struck Earth, but instead exploded in the atmosphere, causing what's known as an air burst. This type of atmospheric explosion was still enough to cause massive damage to the forest in the region.

Scientists determined the object was most likely a stony asteroid approximately the size of a 25-story building. The asteroid was traveling at a speed of about 33,500 miles (54,000 km) per hour and exploded 3 to 6 miles (5 to 10 km) above Earth's surface.

Understanding Tunguska

Why did it take so long – the better part of the 20th century – for scientists to understand what caused the Tunguska event? For one thing, it was almost a decade before the first scientists reached this remote region of Siberia. In 1927, Leonid Kulik led the first Soviet research expedition to investigate the Tunguska event. He made an initial trip to the region, interviewing local witnesses and exploring the area of fallen trees.

But Kulik did not find any meteorite fragments or an impact crater.

As a result of Kulik's initial investigation, some concocted wild theories to explain the Tunguska event. People claimed a stricken alien spacecraft caused the destruction. Later, they pointed to a mini-black-hole, or a particle of antimatter.

The truth is just as interesting, and perhaps more terrifying … because it can happen again.

The Chelyabinsk meteor impact

In fact, the Tunguska event basically did happen again, just on a smaller scale: The Chelyabinsk meteor, 1,500 miles (2,400 km) to the west, 105 years later.

On February 15, 2013, a similar although smaller airburst occurred over the city of Chelyabinsk, Russia.

The Chelyabinsk event provided vital clues as to what happened during the Tunguska event. As NASA explained, new evidence arrived to help solve the mystery of Tunguska:

This highly documented fireball created an opportunity for researchers to apply modern computer modeling techniques to explain what was seen, heard and felt.

Photo from the Soviet Academy of Science 1927 expedition, led by Leonid Kulik, showing trees knocked over by the Tunguska explosion in 1908.

Image via Wikipedia. Photo via the Soviet Academy of Science/ NASA Science.

Smoke trail from the Chelyabinsk meteor, February 15, 2013.

Image via Alex Alishevskikh, who caught it about a minute after the blast.

The models were used with video observations of the fireball and maps of the damage on the ground to reconstruct the original size, motion and speed of the Chelyabinsk object. The resulting interpretation is that Chelyabinsk was most likely a stony asteroid the size of a five-story building that broke apart 15 miles (24 kilometers) above the ground. This generated a shock wave equivalent to a 550-kiloton explosion. The explosion's shock-wave blew out roughly a million windows and injured more than a thousand people. Fortunately, the force of the explosion was not enough to knock down trees or structures.

Per current understanding of the asteroid population, an object like the Chelyabinsk meteor can impact the Earth every 10 to 100 years on average.

Studying Tunguska to prepare for future events

In 2019, scientists published new research about the Tunguska event in a series of papers in a special issue of the journal Icarus. A workshop held at NASA's Ames Research Center in Silicon Valley and sponsored by the NASA Planetary Defense Coordination Office inspired the research.

The theme of the workshop was Re-examining the astronomical cold case of the 1908 Tunguska impact event.

Read more about NASA's research on the Tunguska explosion

In recent decades – due to the Tunguska event, and other, smaller impacts – astronomers have come to take the possibility of catastrophic comet and asteroid impacts seriously. They now have observing programs to watch for near-Earth objects (NEOs), as they're called. At regular meetings they discuss what might happen if we do find a large object on a collision course with Earth.

Future asteroid missions

Two separate missions will travel to the asteroid Didymos. ESA's Hera mission is due to launch in 2024. NASA's DART mission launched November 23, 2021. The DART mission will crash into Didymos's little moonlet between September 26 and October 1 this year to test how we can nudge an object in space and change its course, a challenge we may one day have to undertake if a dangerous object has Earth in its sights. The Hera mission will journey to Didymos to study DART's impact.

Lorien Wheeler, a researcher at NASA Ames Research Center, working on NASA's Asteroid Threat Assessment Project, said:

Because there are so few observed cases, a lot of uncertainty remains about how large asteroids break up in the atmosphere and how much damage they could cause on the ground. However, recent advancements in computational models, along with analyses of the Chelyabinsk and other meteor events, are helping to improve our understanding of these factors so that we can better evaluate potential asteroid threats in the future.

Astronomer David Morrison, also at NASA Ames Research Center, commented:

Tunguska is the largest cosmic impact witnessed by modern humans. It also is characteristic of the sort of impact we are likely to have to protect against in the future.

Bottom line: The Tunguska explosion on June 30, 1908, was the largest asteroid impact in recorded history. It flattened 830 square miles (2,150 sq km) of Siberian forest. Researchers are preparing for future Tunguska-sized events.

Another view of fallen trees at Tunguska in Siberia, in 1929. It wasn't until 1927 that Russian scientists – led by Leonid Kulik – were finally able to get to the scene.

Photo via the Soviet Academy of Science/ NASA Science.

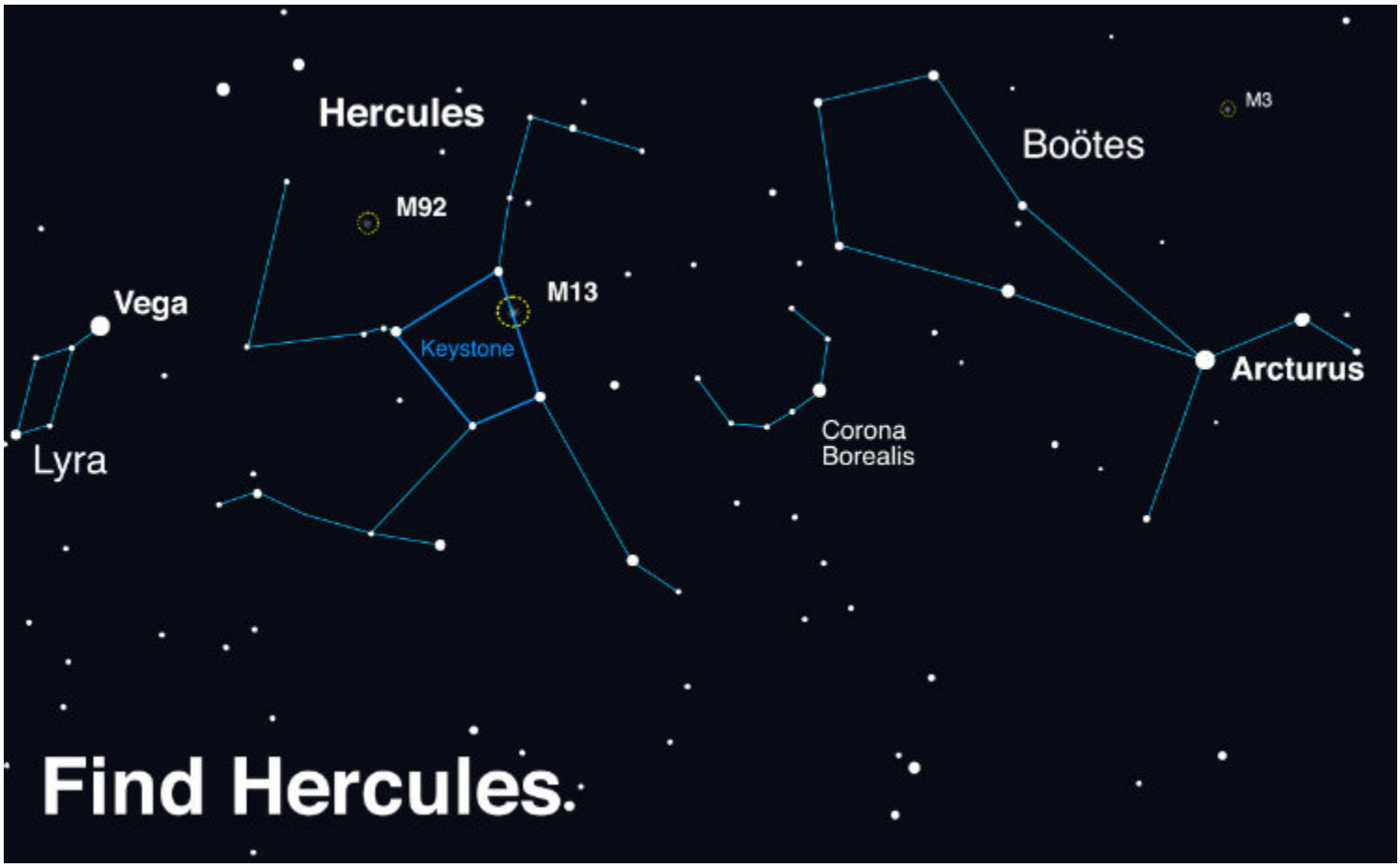
FIND HERCULES AND HIS MIGHTY GLOBULAR CLUSTERS

DAVID PROSPER - NIGHT SKY NETWORK

Hercules is one of the standout heroes of Greek mythology, but his namesake constellation can be surprisingly hard to find - despite being one of the largest star patterns in our night skies! Once you find the stars of Hercules, look deeper; barely hidden in the space around his massive limbs and "Keystone" asterism are two beautiful globular star clusters: M13 and M92!

Since the constellation itself is relatively dim but bordered by brighter constellations, you can find the stars of Hercules by looking between the bright stars Vega and Arcturus. They are fairly easy to identify, and we have tips on how to do so in previous articles. Vega is the brightest star in the constellation Lyra and one of the three stars that make up the Summer Triangle. Arcturus is the brightest star in the constellation Boötes, and can be found by "arcing to Arcturus" from the handle of the Big Dipper. You may be able to Hercules's "Keystone" asterism first; this distinct pattern of four stars is traditionally shown as the torso of the great hero, though some illustrators prefer marking the Keystone as the head of Hercules. What pattern do you see in the stars of Hercules?

Globular star clusters appear "fluffy," round, and dense with stars, similar to a dandelion gone to seed, in contrast to the more scattered and decentralized patterns of open clusters. Open clusters are generally made up of young stars that are gradually spreading apart and found inside our Milky Way galaxy, while globular clusters are ancient clusters of stars that are compact, billions of years old, bound to each other and orbit around our galaxy. Due to their considerable distance, globular clusters are usually only visible in telescopes, but one notable exception is M13, also known as the Great Cluster or Hercules Cluster. During very clear dark nights, skilled observers may be able to spot M13 without optical aid along the border of the Keystone, in between the stars Zeta and Eta Herculis - and a bit closer to Eta. Readily visible as a fuzzy "star" in binoculars, in telescopes M13 explodes with stars and can fill up an eyepiece view with its sparkling stars, measuring a little over half the diameter of a full Moon in appearance! When viewed through small telescopes, globular clusters can appear orblike and without discernable member stars, similar in appearance to the fuzzy comae of distant comets. That's why comet hunters Edmund Halley and Charles Messier discovered and then catalogued M13, in 1714 and 1764 respectively, marking this faint fuzzy as a "not-comet" so as to avoid future confusion.



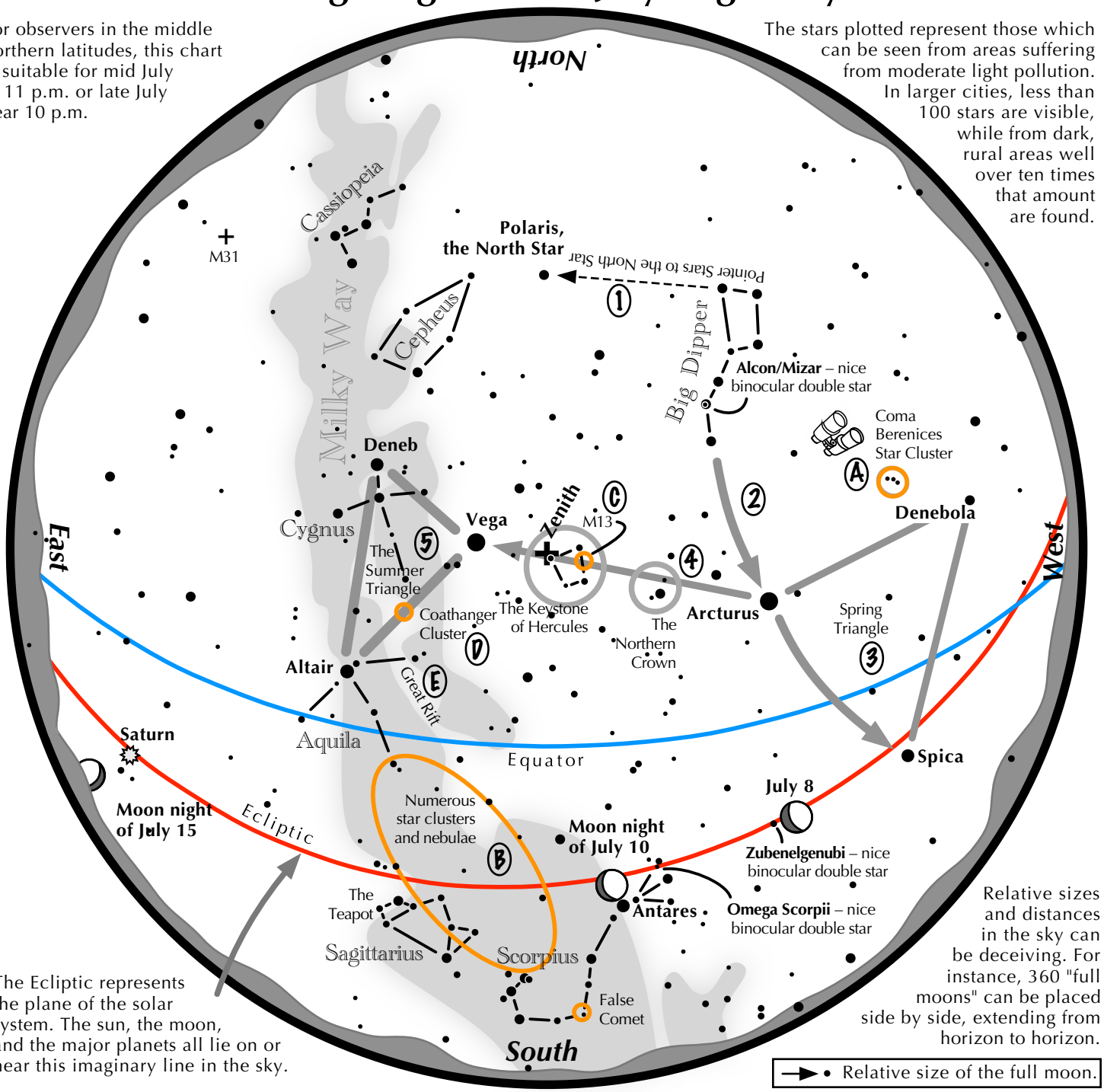
While enjoying your view of M13, don't forget to also look for M92! This is another bright and bold globular cluster, and if M13 wasn't so spectacular, M92 would be known as the top celestial sight in Hercules. M92 also lies on the edge of naked-eye visibility, but again, binoculars and especially a telescope are needed to really make it "pop." Even though M92 and M13 appear fairly close together in the sky, in actuality they are rather far apart: M13's distance is estimated at about 25,000 light years from Earth, and M92's at approximately 27,000 light years distant. Since M13 and M92 appear so close together in our skies and relatively easy to spot, switching between these two clusters in your scope makes for excellent star-hopping practice. Can you observe any differences between these two ancient clusters of stars?

Globular clusters are closely studied by astronomers for hints about the formation of stars and galaxies. The clusters of Hercules have even been studied by NASA's space telescopes to reveal the secrets of their dense cores of hundreds of thousands of stars. Find their latest observations of globular clusters - and the universe - at nasa.gov.

Navigating the mid July Night Sky

For observers in the middle northern latitudes, this chart is suitable for mid July at 11 p.m. or late July 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 July 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 first intersects Arcturus, the brightest star in the July evening sky, then continues to Spica.
3. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
4. To the northeast of Arcturus shines another star of similar 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.
5. High in the East lies the Summer Triangle stars of Vega, Altair, and Deneb.

Binocular Highlights

A: Between Denebola and the tip of the Big Dipper's handle, lie the stars of the Coma Berenices Star Cluster.
B: Between the bright stars Antares and Altair, hides an area containing many star clusters and nebulae.
C: On the western side of the Keystone glows the Great Hercules Cluster, containing nearly 1 million stars.
D: 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger.
E: Sweep along the Milky Way for an astounding number of faint glows and dark bays, including the Great Rift.

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

OBSERVING LISTS

Top ten deep-sky objects for July	
M4	M13
M6	M92
M7	NGC 6210
M10	NGC 6231
M12	NGC 6543

Top ten deep-sky binocular objects for July	
IC 4665	M10
LDN 1773	M12
M4	M13
M6	M92
M7	NGC 6231

Challenge deep-sky object for July

NGC 6380 (globular cluster)

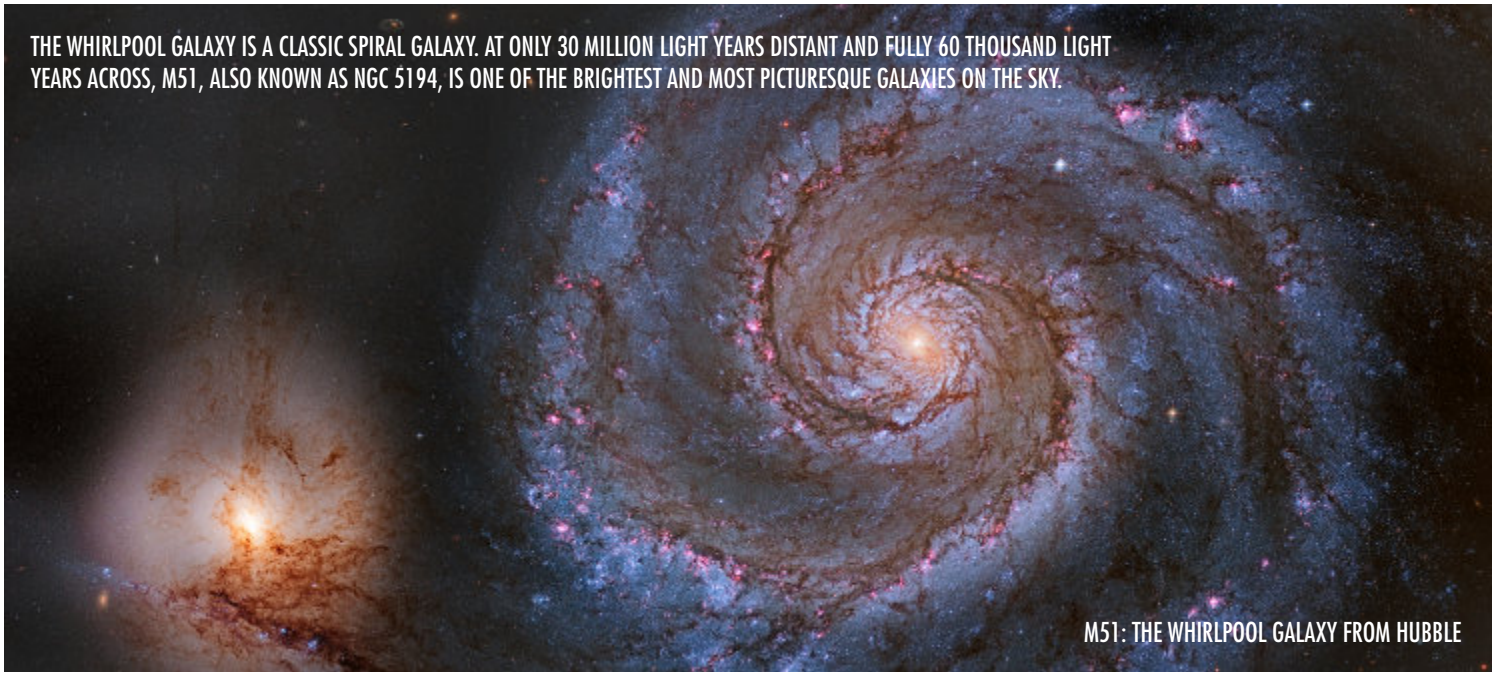
NGC 6380 is a globular cluster located in the constellation Scorpius. It is situated south of the celestial equator and, as such, it is more easily visible from the southern emisphere.

Apparent Magnitude: 11.3

Apparent Size: 3.9 arcmin

THIS MONTH IN ASTRONOMY

- The light from Supernova SN 1054 was first noted by Chinese astronomers on July 4, 1054.
- The first lunar map was drawn by Thomas Harriot on July 26, 1609.
- Charles Messier discovered the globular cluster M28 in Sagittarius on July 27, 1764.
- Comet D/1770 L1 (Lexell) passed closer to the Earth than any comet in recorded history on July 1, 1770.
- Charles Messier discovered the globular cluster M54 in Sagittarius on July 24, 1778.
- Caroline Herschel discovered the open cluster NGC 6866 in Cygnus on July 23, 1783.
- The globular cluster NGC 6569 in Sagittarius was discovered by William Herschel on July 13, 1784.
- Karl Ludwig Hencke discovered asteroid 6 Hebe on July 1, 1847.
- The first photograph of a star, namely Vega, was taken on July 17, 1850.
- The first photograph of a total solar eclipse was taken on July 28, 1851.
- Hendri Deslandres invented the spectroheliograph on July 24, 1853.
- Sinope, one of Jupiter's many satellites was discovered by Seth Nicholson on July 21, 1914.
- Karl Jansky announced the detection of radio radiation from the center of the Milky Way on July 8, 1933.
- Seth Nicholson discovered Neptune's satellite Lysithea on July 6, 1938.
- The Mariner 4 probe took the first close-up image of another planet, namely Mars, on July 14, 1965.
- The Apollo 11 lunar module landed on the Moon on July 20, 1969.
- Neptune's satellites Despinea and Galatea are discovered using images from the Voyager 2 probe on July 27, 1989.
- Fragments of Comet D/1993 F2 (Shoemaker-Levy) impacted Jupiter on July 16, 1994.
- Prospero, one of the satellites of Uranus, is discovered by Matthew Holman on July 18, 1999.
- Pluto's satellite Styx is discovered using images from the New Horizon probe on July 11, 2012.



THE WHIRLPOOL GALAXY IS A CLASSIC SPIRAL GALAXY. AT ONLY 30 MILLION LIGHT YEARS DISTANT AND FULLY 60 THOUSAND LIGHT YEARS ACROSS, M51, ALSO KNOWN AS NGC 5194, IS ONE OF THE BRIGHTEST AND MOST PICTURESQUE GALAXIES ON THE SKY.

M51: THE WHIRLPOOL GALAXY FROM HUBBLE

July 2022 Astronomy Events Calendar

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
					1 **LAS Meeting @ 8pm** **Summer Viewing Program**	2
3	4 Earth at aphelion (orbital point at which Earth is furthest from the Sun.)	5	6 Mercury at ascending node	7 **First quarter Moon**	8 **Summer Viewing Program**	9
10 Mercury at perihelion	11	12 Vesta stationary	13 **Full Moon: Largest in 2022** Moon at perigee **Large Tides**	14	15 **Summer Viewing Program** Saturn 4° N of Moon	16 **Summer Moon Festival** Mercury in superior conjunction
17 **Summer Moon Festival**	18 Neptune 3° N of Moon	19 **Jupiter 2° N of Moon**	20 **Last quarter Moon** Venus 1.5° S of M35 Pluto at opposition	21 **Mars 1.1° S of Moon** Mercury at greatest heliocentric lat. N	22 **Summer Viewing Program** **Uranus 0.2° S of Moon** Ceres in conjunction with the Sun	23
24 31	25	26 Moon at apogee **Venus 4° S of Moon**	27	28 **New Moon** Juno stationary	29 **Summer Viewing Program** Jupiter stationary Delta-Aquariid meteors peak	30