Volume 49 Number 5 May 2023

The Celestial Mechanic

The Official Newsletter of the Astronomy Associates of Lawrence

Coming Events

Monthly Meeting
No May Meeting
Baker Wetlands Discovery Center

Public Observing
No May Observing
Baker Wetlands Discovery Center

Club Officers

President
Rick Heschmeyer email

AICOR
William Winkler email

NSN Coordinator
Howard Edin email

Faculty Advisor
Dr. Jennifer Delgado email.

Newsletter Editor
Chuck Wehner email

Inside This Issue

Report From the Officers

By Rick Heschmeyer

I hope everyone was able to get out and view the auroral display on the night of April 23rd.

April was a busy month for AAL. On April 1, Rick Heschmeyer and Jerelyn Ramirez joined members of ASKC and KAO at the Fort Scott National Historic Site in Fort Scott, Kansas for their first ever "Star Party at the Fort". There were a dozen telescopes sharing views of the night sky with about 125 attendees, who were also entertained by a bright pass of the International Space Station.

Two days later, AAL partnered with the Lawrence Public Library for the rescheduled "PlanetPalooza" event. Over the course of the evening about 75 people enjoyed views of the Moon, Mars, and the Orion Nebula, as well as another long and bright pass of the ISS.

On April 15, AAL participated in Baker Wetlands Discovery Center's Family Fun Day. While clouds forced the cancellation of the solar observing, we had a table inside with a meteorite display for the 130 guests.

Our April Club Meeting, on April 30, the focus was the upcoming 2023 and 2024 Solar Eclipses, with a presentation about the events and discussions about AAL plans for the eclipses.

The next Telescope Night at KU is scheduled for Thursday May 11. We will forward the flyer when it is produced.

As the school year winds down, we will not have a May Club Meeting, but will instead be planning another combined AAL/KU Department of Physics and Astronomy Star Party to be held at Baker Wetlands Discovery Center on Saturday evening, May 20th. More details will follow.

And finally, the Lawrence City Band has released its South Park summer concert schedule. The dates we will be observing following the concerts are:

Wednesday, May 31

Wednesday, June 14

Wednesday, June 28

Wednesday, July 12

Observing will follow the conclusion of the concerts at 9PM each of these evenings.

Hubble telescope spies mysterious celestial object that defies classification

By Stefanie Waldek
SPACE.COM, MARCH 29, 2023

Z 229-15 — imaged here in beautiful detail by the NASA/ESA Hubble Space Telescope — a celestial object that lies about 390 million light-years from Earth in the constellation Lyra.

Space is hard, the adage goes. And we'd extrapolate that sentiment to the classification of celestial objects, particularly ones like Z 229-15.

A newly released image taken by the Hubble Space Telescope shows Z 229-15, which, at first glance, simply appears to be a spiral galaxy, given its two spiraling arms of stars emanating from a bright core. But it's far, far more than that.

Z 229-15 is one of those objects that fits several classifications, according to a statement released by the European Space Agency (ESA). "Z 229-15 is one of those interesting celestial objects that, should you choose to research it, you will find defined as several different things," the statement reads. While it's impossible to pin down a singular classification for Z 229-15, there are several overlapping definitions that together describe this wondrous celestial object.

First and foremost, Z 229-15 is indeed a galaxy, which is a gravitationally bound collection of stars.

Second, it's an active galactic nucleus (AGN), or rather, it contains an AGN. An AGN is a region at the center of a galaxy that is exceptionally bright due to a supermassive black hole at its core. It's not the black hole itself that's so luminous, but rather all the material from the galaxy that has been trapped in a spinning disk around it, having been drawn toward the black hole by its intense gravitational pull. That disk heats up and emits massive amounts of energy across the electromagnetic spectrum, resulting in the brightness.

And that's not all. Z 229-15's AGN is also a quasar, which is a specific subtype of AGN. The criteria for an AGN to be classified as a quasar include extreme brightness and a great distance away from Earth — on a cosmic scale, of course. As you can see from the Hubble image, Z 229-15 is indeed very bright in the center. And given that it's 390 million light-years away from Earth, it's far enough away to be considered a quasar (though that distance means it's actually a "nearby" quasar).

You bet there's more. Most quasars are so bright that they drown out our view of the stars in the galaxy. But when a quasar isn't that bright, allowing us to see stars, it's considered a Seyfert galaxy. And per the stars visible in its Hubble portrait, Z 229-15 is definitely a Seyfert galaxy.

So, technically, Z 229-15 is a Seyfert galaxy with a quasar-subclass AGN. As ESA, which co-manages Hubble with NASA, calls it, Z 229-15 is "Everything, in one place, all at once" — a clever nod to this year's Academy Awards Best Picture winner "Everything, Everywhere, All at Once." ☀

Solar Eclipses Are Coming!

By David Prosper

NIGHTSKYNETWORK, APRIL 2023

This detailed solar eclipse map shows the paths of where and when the Moon's shadow will cross the USA for the upcoming 2023 annular solar eclipse and 2024 total solar eclipse, made using data compiled from multiple NASA missions. Where will you be? This map is very detailed, so if you would like to download a larger copy of the image, you can do so and find out more about its features at: https://svs.gsfc.nasa.gov/5073

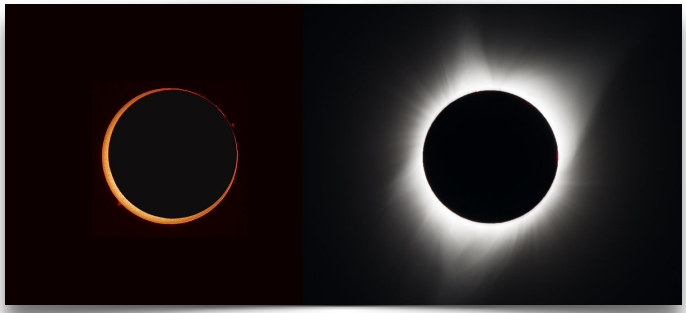
Have you ever witnessed a total solar eclipse? What about an annular solar eclipse? If not, then you are in luck if you live in North America: the next twelve months will see two solar eclipses darken the skies for observers in the continental United States, Mexico, and Canada!

Solar eclipse fans get a chance to witness an **annular eclipse** this fall. On **Saturday, October 14, 2023**, the Moon will move exactly in front of the Sun from the point of view of observers along a narrow strip of land stretching across the United States from Oregon to Texas and continuing on to Central and South America. Since the Moon will be at its furthest point in its orbit from Earth at that time (known as *apogee*), it won't completely block the Sun; instead, a dramatic "ring" effect will be seen as the bright edge of the Sun will be visible around the black silhouette of the Moon. The distinct appearance of this style of eclipse is why it's called an annular eclipse, as *annular* means *ring-like*. If you are standing under a tree or behind a screen you will see thousands of ring-like shadows projected everywhere during maximum eclipse, and the light may take on a wan note, but it won't actually get dark outside; it will be similar to the brightness of a cloudy day. This eclipse must only be observed with properly certified eclipse glasses, or other safe observation methods like pinhole projection or shielded solar telescopes. Even during the peak of the eclipse, the tiny bit of the Sun seen via the "ring" can damage your retinas and even blind you.

Just six months later, a dramatic **total solar eclipse** will darken the skies from Mexico to northeast Canada, casting its shadow across the USA in a strip approximately 124 miles (200 km) wide, on **Monday, April 8, 2024**. While protection must be worn to safely observe most of this eclipse, it's not needed to witness totality itself, the brief amount of time when the Moon blocks the entire surface of the Sun from view. And if you try to view totality through your eclipse viewer, you won't actually be able to see anything! The Moon's shadow will dramatically darken the skies into something resembling early evening, confusing animals and delighting human observers. You will even be able to see bright stars and planets - provided you are able to take your eyes off the majesty of the total eclipse! While the darkness and accompanying chilly breeze will be a thrill, the most spectacular observation of all will be the Sun's magnificent *corona!* Totality is the only time you can observe the corona, which is actually the beautiful outer fringes of the Sun's atmosphere. For observers in the middle of the path, they will get to experience the deepest portion of the eclipse, which will last over four minutes - twice as long as 2017's total solar eclipse over North America.

While some folks may be lucky enough to witness both eclipses in full – especially the residents of San Antonio, Texas, whose city lies at the crossroads of both paths – everyone off the paths of maximum eclipse can still

catch sight of beautiful partial eclipses if the skies are clear. The Eclipse Ambassadors program is recruiting volunteers across the USA to prepare communities off the central paths in advance of this amazing cosmic ballet. Find more information and apply to share the excitement at eclipseambassadors.org. NASA has published a fantastic Solar Eclipse Safety Guide which can help you plan your viewing at bit.ly/nasaeclipsesafety. And you can find a large collection of solar eclipse resources, activities, visualizations, photos, and more from NASA at solarsystem.nasa.gov/eclipses



Photos of an annular total solar eclipse (left) and a total solar eclipse (right). Note that the annular eclipse is shown with a dark background, as it is only safe to view with protection – you can see how a small portion of the Sun is still visible as the ring around the Moon. On the right, you can see the Sun's wispy corona, visible only during totality itself, when the Moon completely – or totally - hides the Sun from view. A total solar eclipse is only safe to view without protection during totality itself; it is absolutely necessary to protect your eyes throughout the rest of the eclipse!

Runaway supermassive black hole is hurtling through space followed by tail of infant stars

By Robert Lea
SPACE.COM, APRIL 7, 2023

A runaway supermassive black hole ejected from its own galaxy, possibly in a tussle with two other black holes, is being trailed by a 200,000 light-year-long chain of infant stars, a new study reports.

The incredible sight, which is like nothing astronomers have spotted before, was identified by the Hubble Space Telescope in a happy accident.

The supermassive black hole, with a mass equivalent to 20 million suns, is traveling so fast that it would cover the distance between Earth and the moon in just 14 minutes.

As it travels, the cosmic runaway is piling up gas in front of it. When dense regions of gas like those left in the wake of this rogue black hole collapse, new stars are born. A supermassive black hole cruising through clouds of gas would normally feed on it, a process called accretion. But this runaway cosmic monster is moving too fast to grab a bite.

As a result, the rogue black hole is actively creating a corridor of infant stars, and these are forming a tail that tracks right back to the supermassive black hole's galaxy of origin, researchers said. And this tail is half as bright as that galaxy, meaning it must be absolutely brimming with stars.

"We think we're seeing a wake behind the black hole where the gas cools and is able to form stars. So, we're looking at star formation trailing the black hole," study lead author Pieter van Dokkum, of Yale University, said in a statement.

"What we're seeing is the aftermath. Like the wake behind a ship, we're seeing the wake behind the black hole. It didn't look like anything we've seen before."

At the outermost tip of the column of stars in a knot of ionized oxygen that is incredibly bright. The team believes that this is the result of the black hole striking gas, shocking it and heating it.

"Gas in front of it gets shocked because of this supersonic, very-high-velocity impact of the black hole moving through the gas," said van Dokkum. "How it works exactly is not really known."

Something else that isn't totally clear yet is how the supermassive black hole came to be launched out of its host galaxy.

Kicked out by a cosmic cuckoo

The team thinks that the ejected black hole could have escaped its host galaxy as the result of multiple collisions of supermassive black holes, the first occurring when two galaxies merged 50 million years ago, bringing two cosmic titans close together.

As these supermassive black holes circled around each other, another galaxy entered the mix, carrying with it another supermassive black hole. Following the old adage "two's company and three's a crowd," the interaction between the three black holes was chaotic and led to one black hole stealing momentum from the others and hurtling off into space.

That means there's a good chance that the interloper black hole introduced itself to the system and eventually replaced one of the original black holes, like a cosmic cuckoo.

As the runaway black hole blasted away from its former companions, the new pairing would have moved in the opposite direction. And there are hints at a runaway black-hole binary on the opposite side of the host galaxy to the black hole racing through space with its stellar tail.

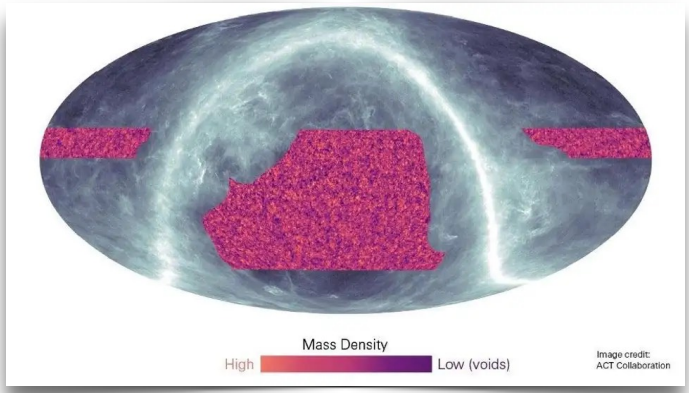
The next step for this research will be to search for evidence of these binary black holes with NASA's James Webb Space Telescope (JWST) and the Chandra X-ray Observatory, study team members aid.

Scientists will be hoping for the same good fortune experienced by van Dokkum and his team when they initially made the extraordinary observation of this massive cosmic runaway.

"This is pure serendipity that we stumbled across it," van Dokkum concluded. "I was just scanning through the Hubble image, and then I noticed that we have a little streak. I immediately thought, 'Oh, a cosmic ray hitting the camera detector and causing a linear imaging artifact.' When we eliminated cosmic rays, we realized it was still there." ☀

New Map of Dark Matter Validates Einstein's Theory of Gravity

Researchers can "clearly see features of this invisible world that are hundreds of millions of light-years across."



Areas of more (orange) and less (purplish) mass showing the distribution of dark matter in the universe.

By Isaac Schultz

QIZMODO.COM, APRIL 12, 2023

Scientists using data from the Atacama Cosmology Telescope in Chile have made a detailed map of dark matter's distribution across a quarter of the sky.

The map shows regions the distribution of mass extending essentially as far we can see back in time; it uses the cosmic microwave background as a backdrop for the dark matter portrait. The team's research will be presented at the Future Science with CMB x LSS conference in Kyoto, Japan.

"We have mapped the invisible dark matter across the sky to the largest distances, and clearly see features of this invisible world that are hundreds of millions of light-years across," said Blake Sherwin, a cosmologist at the University of Cambridge, in a Princeton University release. "It looks just as our theories predict."

Dark matter is a catch-all term for the stuff that makes up about 27% of the universe, but it is not directly observable. We only know it's there, whatever it is, because of its gravitational effects.

People probe dark matter through two main approaches: Earth-based experiments and sweeping

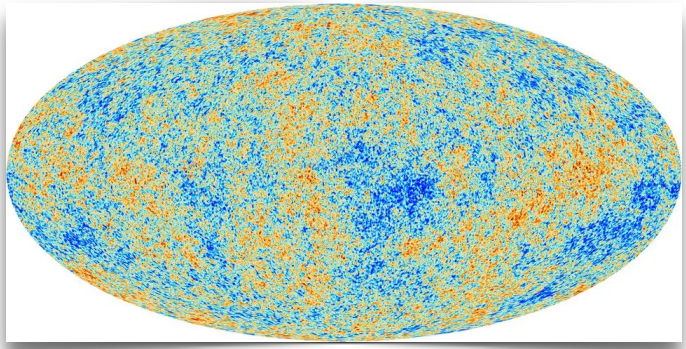
observations of the cosmos. There are plenty of experiments that try to identify dark matter amidst a sea of proposed dark matter candidates, which include axions and Weakly Interacting Massive Particles (WIMPs).

But the only way dark matter is observed is indirectly, in the way its gravitational effects are observed at large scales. Enter the Atacama Cosmology Telescope, which more precisely dated the universe in 2021. The telescope's map builds on a map of the universe's matter released earlier this year, which was produced using data from the Dark Energy Survey and the South Pole Telescope. That map upheld previous estimations of the ratio of ordinary matter to dark matter and found that the distribution of the matter was less clumpy than previously thought.

The new map homes in on a lingering concern of Einstein's general relativity: how the most massive objects in the universe, like supermassive black holes, bend light from more distant sources. One such source is the cosmic microwave background, the most ancient detectable light, which radiates from the aftermath of the Big Bang.

The researchers effectively used the background as a backlight, to illuminate regions of greater density in the universe.

"It's a bit like silhouetting, but instead of just having



The cosmic microwave background as seen by the European Space Agency's Planck observatory.

black in the silhouette, you have texture and lumps of dark matter, as if the light were streaming through a fabric curtain that had lots of knots and bumps in it," said Suzanne Staggs, director of the Atacama Cosmology Telescope and a physicist at Princeton, in the university release.

"The famous blue and yellow CMB image is a snapshot of what the universe was like in a single epoch, about 13 billion years ago, and now this is giving us the information about all the epochs since," Staggs added.

The recent analysis suggests that the dark matter was lumpy enough to fit with the standard model of cosmology, which relies on Einstein's theory of gravity.

Eric Baxter, an astronomer at the University of Hawai'i and a co-author of the research that resulted in the February dark matter map, told Gizmodo in an email that his team's map was sensitive to low-redshifts (meaning close by, in the more recent universe). On the other hand, the newer map focuses exclusively on the lensing of the cosmic microwave background, meaning higher redshifts and a more sweeping scale.

"Said another way, our measurements and the new ACT measurements are probing somewhat different (and complementary) aspects of the matter distribution," Baxter said. "Thus, rather than contradicting our previous results, the new results may be providing an important new piece of the puzzle about possible discrepancies with our standard cosmological model."

"Perhaps the Universe is less lumpy than expected on small scales and at recent times (i.e. the regime probed by our analysis), but is consistent with expectations at earlier times and at larger scales," Baxter added.

New instruments should help tease out the matter distribution of the universe. An upcoming telescope at the Simons Observatory in the Atacama is set to begin operations in 2024 and will map the sky nearly 10 times faster than the Atacama Cosmology Telescope, according to the Princeton release.

With the largest digital camera ever built set to be installed at the Vera Rubin Observatory, also in the Atacama, it's an exciting time for Earth-based observatories. ☀

GIANT GALAXY SEEN IN 3D BY NASA'S HUBBLE SPACE TELESCOPE AND KECK OBSERVATORY

Hubblesite, april 13, 2023

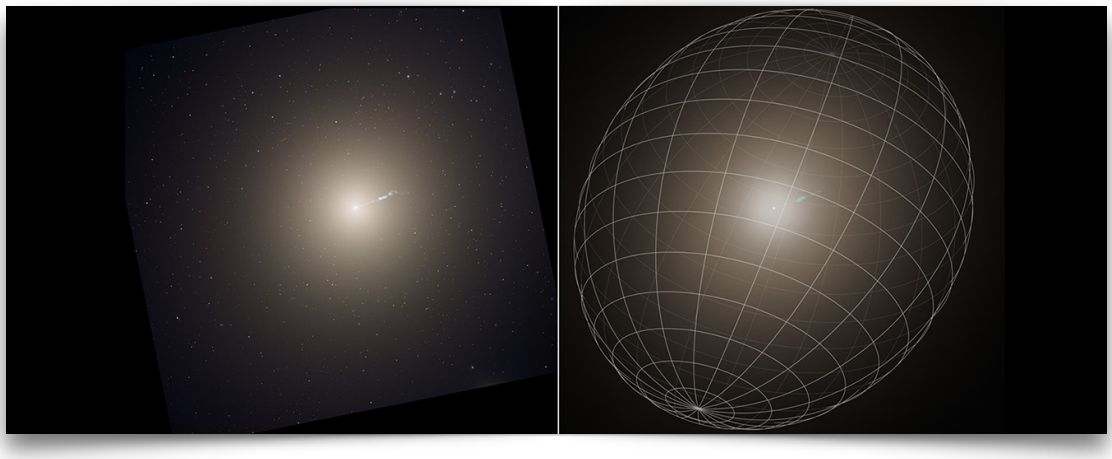
SUMMARY

A HUGE CITY OF MYRIAD STARS TURNS OUT TO BE POTATO-SHAPED

Though it's estimated that the universe contains 1 trillion galaxies, they come in just a few basic shapes. American astronomer Edwin Hubble realized this in the early 20th century when he used the most powerful telescope on Earth at the time to peer across the universe. Like a kid collecting rocks, he sorted them into shapes. Many were flattened spiral disks of stars. Others looked like cotton balls, which he called elliptical galaxies. Though the universe is three-dimensional, galaxies look flat on the sky. They are too far away for astronomers to employ stereoscopic vision. Now, a century later, astronomers at last have the tools to estimate the true shape of an elliptical galaxy. They picked one of the nearest elliptical galaxies to Earth, M87, located 55 million light-years away in the heart of the vast Virgo cluster of galaxies. By following the motion of stars around the center of M87, like bees around a hive, they've measured that the galaxy looks potato-shaped. It not only has a long and short axis, which defines an ellipse on a piece of graph paper, but they measured a third axis which helps define the three-dimensionality. The geometric term is: triaxial.

Though we live in a vast three-dimensional universe, celestial objects seen through a telescope look flat because everything is so far away. Now for the first time, astronomers have measured the three-dimensional shape of one of the biggest and closest elliptical galaxies to us, M87. This galaxy turns out to be "triaxial," or potato-shaped. This stereo vision was made possible by combining the power of NASA's Hubble Space Telescope and the ground-based W. M. Keck Observatory on Maunakea, Hawaii.

In most cases, astronomers must use their intuition to figure out the true shapes of deep-space objects. For example, the whole class of huge galaxies called "ellipticals" look like blobs in pictures. Determining the



true shape of giant elliptical galaxies will help astronomers understand better how large galaxies and their central large black holes form.

Scientists made the 3D plot by measuring the motions of stars that swarm around the galaxy's supermassive central black hole. The stellar motion was used to provide new insights into the shape of the galaxy and its rotation, and it also yielded a new measurement of the black hole's mass. Tracking the stellar speeds and position allowed researchers to build a three-dimensional view of the galaxy.

Astronomers at the University of California, Berkeley, were able to determine the mass of the black hole at the galaxy's core to a high precision, estimating it at 5.4 billion times the mass of the Sun. Hubble observations in 1995 first measured the M87 black hole as being 2.4 billion solar masses, which astronomers deduced by clocking the speed of the gas swirling around the black hole. When the Event Horizon Telescope, an international collaboration of ground-based telescopes, released the first-ever image of the same black hole in 2019, the size of its pitch-black event horizon allowed researchers to

calculate a mass of 6.5 billion solar masses using Einstein's theory of general relativity.

The stereo model of M87 and the more precise mass of the central black hole could help astrophysicists learn the black hole's spin rate. "Now that we know the direction of the net rotation of stars in M87 and have an updated mass of the black hole, we can combine this information with data from the Event Horizon Telescope to constrain the spin," said Chung-Pei Ma, a UC Berkeley lead investigator on the research.

Over ten times the mass of the Milky Way, M87 probably grew from the merger of many other galaxies. That's likely the reason M87's central black hole is so large — it assimilated the central black holes of one or more galaxies it swallowed.

Ma, together with UC Berkeley graduate student Emily Liepold (lead author on the paper published in the Astrophysical Journal Letters) and Jonelle Walsh at Texas A&M University were able to determine the 3D shape of M87 thanks to a new precision instrument mounted on the Keck II Telescope. They pointed Keck at 62 adjacent locations of the galaxy, mapping out the spectra of stars over a region about 70,000 light-years across. This region spans the central 3,000 light-years where gravity is largely dominated by the supermassive black hole. Though the telescope cannot resolve individual stars because of M87's great distance, the spectra can reveal the range of velocities to calculate mass of the object they're orbiting.

"It's sort of like looking at a swarm of 100 billion bees," said Ma. "Though we are looking at them from a distance and can't discern individual bees, we are getting very detailed information about their collective velocities."

The researchers took the data between 2020 and 2022, as well as earlier star brightness measurements of M87 from Hubble, and compared them to computer model predictions of how stars move around the center of the triaxial-shaped galaxy. The best fit to this data allowed them to calculate the black hole's mass. "Knowing the 3D shape of the 'swarming bees' enabled us to obtain a more robust dynamical measurement of the mass of the central black hole that is governing the bees' orbiting velocities," said Ma.

In the 1920s, astronomer Edwin Hubble first classified galaxies according to their shapes. Flat disk spiral galaxies could be viewed from various projection angles of the sky: face-on, oblique, or edge-on. But the "blobby-looking" galaxies were more problematic to characterize. Hubble came up with the term elliptical. They could only be sorted out by how great the ellipticity was. They didn't have any apparent dust or gas inside of them for better distinguishing between them. Now, a century later astronomers have a stereoscopic look at a prototypical elliptical galaxy. ☀

SpaceX's Starship Rocket Explodes After Launch

Nytimes, april 20, 2023

The most powerful rocket ever built got off the launchpad in South Texas but did not achieve its most ambitious goals on Thursday.

Starship, the tallest and most powerful rocket ever built, cleared the launchpad before exploding during its first test flight.

SpaceX's Starship rocket exploded on Thursday, minutes after lifting off from a launchpad in South Texas. The spacecraft, the most powerful ever to launch, failed to reach orbit, but it was not a total failure for the private spaceflight company.

Before the launch, Elon Musk, the company's founder, had tamped down expectations, saying it might take several tries before Starship succeeds at this test flight, which was to reach speeds fast enough to enter orbit before splashing down in the Pacific Ocean near Hawaii.

The enthusiasm of the space fans who gathered for the launch was unbowed by the mission's outcome. Karl Kriegh, 69, and his wife traveled from Colorado for the launch, and lingered on the beach at South Padre Island after the rocket exploded. "I'm so glad I've lived to see this," he said. "It was incredibly dramatic, one of those things on the bucket list." ☀

BIENVENUE EN LOUISIANE! (WELCOME TO LOUISIANA!)

Join us for this unique and exciting amateur astronomy gathering!

ALCON 2023

July 26–29, 2023

Hilton Baton Rouge
Capitol Center Hotel
201 Lafayette Street
Baton Rouge, LA 70801

KEYNOTE SPEAKERS

- David Eicher–writer, editor-in-chief of *Astronomy Magazine*
- Fred Espanak–co-author of *Totality: The Great American Eclipses of 2017 and 2024*
- David Levy–author, comet hunter

FIELD TRIPS

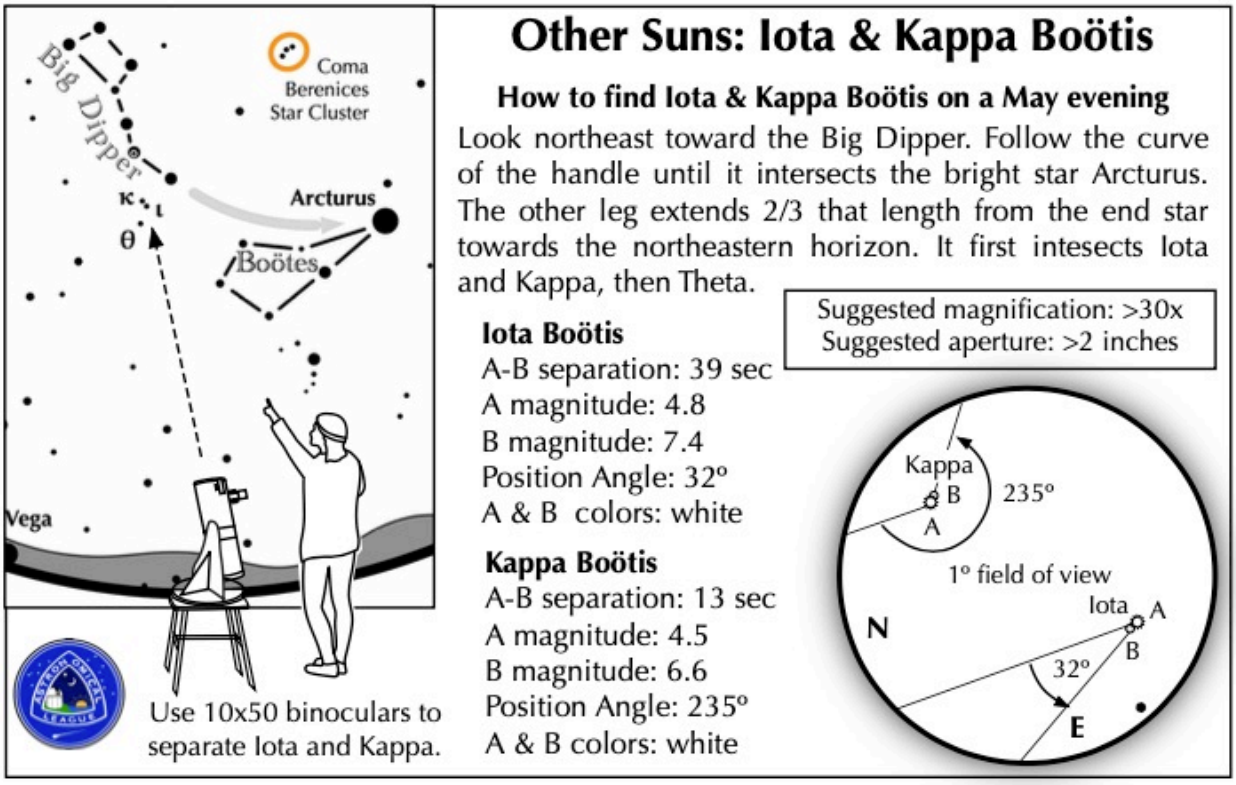
- Irene Pennington Planetarium
- LIGO (Laser Interferometer Gravitational-Wave Observatory) Livingston*
- Louisiana State University Physics & Astronomy
- Highland Road Park Observatory

*Spaces are limited for this trip!

SPEAKERS ★ Pranvera Hyseni ★ Guy Consolmagno ★ Dan Davis ★ And many more!

Brought to Baton Rouge by the **Baton Rouge Astronomical Society**

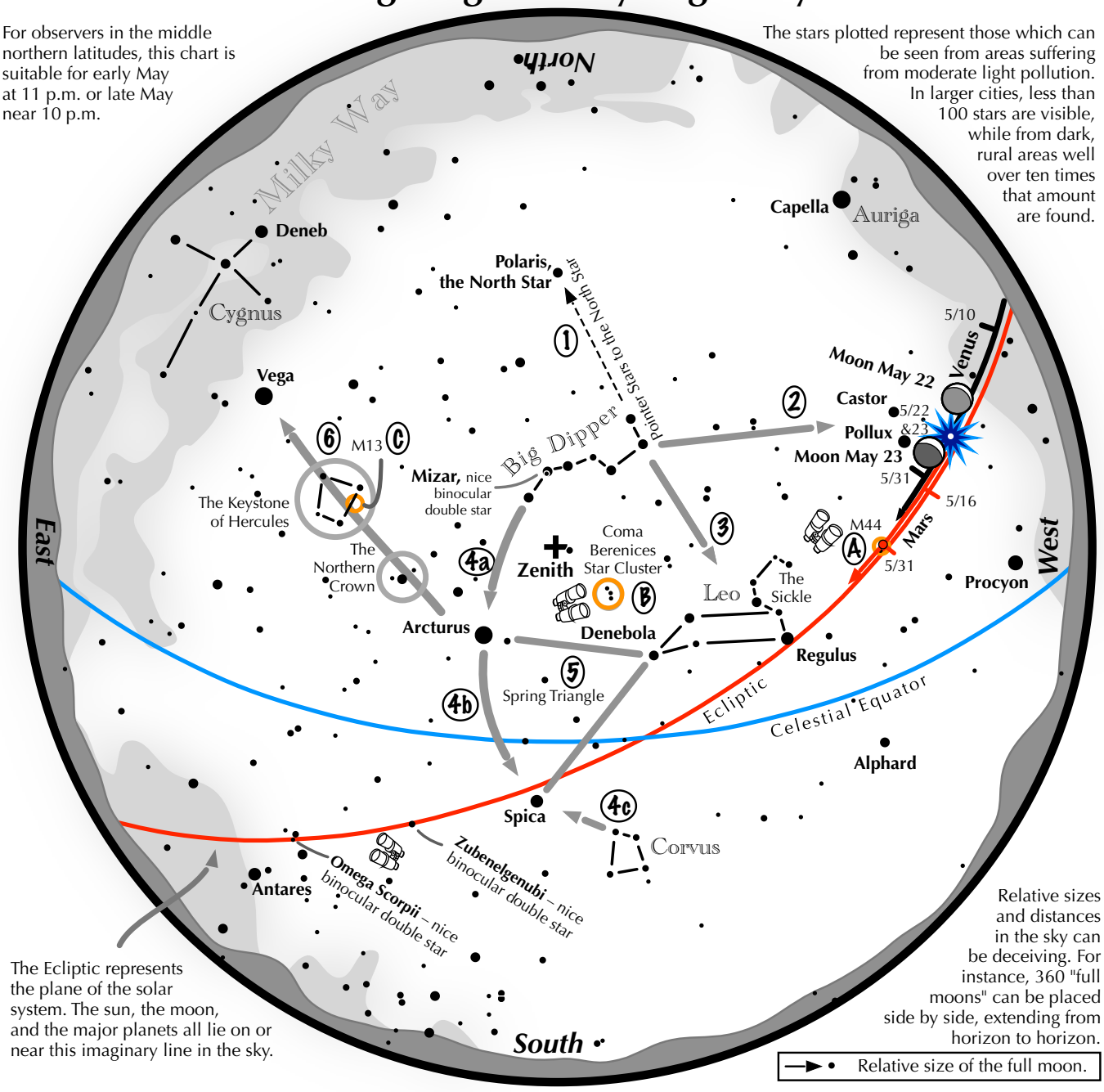
★★ Registration is now open! Check ***alcon2023.org*** ★★



Navigating the May Night Sky

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

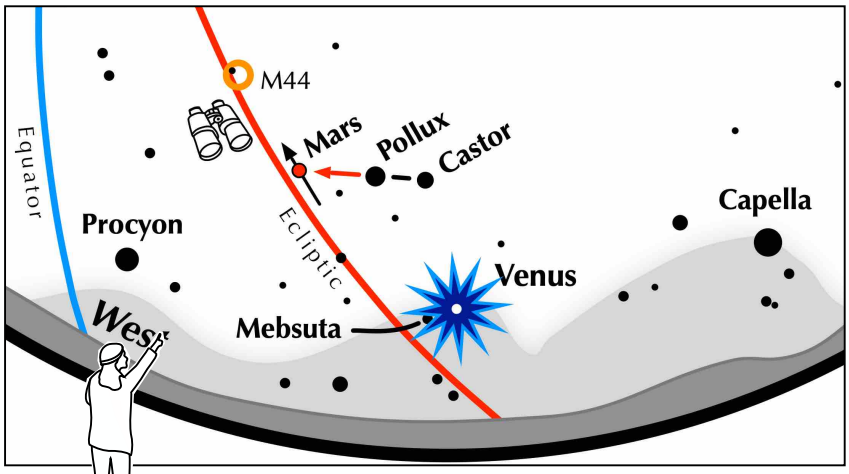
Navigating the May night sky: Simply start with what you know or with what you can easily find.

1. Extend a line northward from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
2. Through the two diagonal stars of the Dipper's bowl, draw a line pointing to the twin stars of Castor and Pollux in Gemini.
3. Directly below the Dipper's bowl reclines the constellation Leo with its primary star, Regulus.
4. Follow the arc of the Dipper's handle. It first intersects Arcturus, then continues to Spica.
   Confirm Spica by noting that two moderately bright stars just to its southwest form a straight line with it.
5. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
6. Draw a line from Arcturus to Vega. One-third of the way sits "The Northern Crown." Two-thirds of the way hides the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.

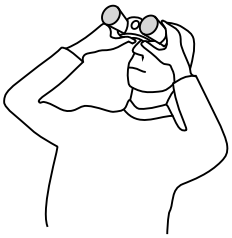
Binocular Highlights
A: M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux. **B:** Look near the zenith for the loose star cluster of Coma Berenices. **C:** M13, a round glow from a cluster of over 500,000 stars.

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

If you can see only one celestial event in the evening this May, see this one.



The twin stars of Gemini become triplets!



Beginning in the second week of May, look to the west-northwest 90 minutes after sunset.

- The twin stars of Gemini, Castor and Pollux, will be found forming a horizontal bar.
- Red Mars, sporting a brightness mid way between those two stars, rises nightly, eventually sliding directly to their left.
- On **May 16**, the three luminaries form a straight line, effectively creating another member of Gemini, the Triplets!
- Look at Venus, brilliantly shining below them. Can you see the moderately bright star Mebsuta in the glare of Venus? Binoculars will certainly help.
- The bright stars Procyon and Capella act like opposing bookends for the scene.
- Over next two weeks, watch Mars approach M44, the Beehive cluster, and Venus move near Castor and Pollux.

About Astronomy Associates

The club is open to all people interested in sharing their love for astronomy. Monthly meetings are typically on the last Sunday of each month and often feature guest speakers, presentations by club members, and a chance to exchange amateur astronomy tips. These meetings and the public observing sessions that follow are scheduled at the Baker Wetlands Discovery Center, south of Lawrence. All events and meetings are free and open to the public. Periodic star parties are scheduled as well.

Because of the flexibility of the schedule due to holidays and alternate events, it is always best to check the Web site for the exact Sundays when events are scheduled.

Copies of the Celestial Mechanic can also be found on the web at newsletter.
Annual Dues for the club are: $12 for regular members; $6 for students Membership forms can be accessed at the club website form.