

# The Celestial Mechanic

The Official Newsletter of the Astronomy Associates of Lawrence



## Coming Events

### Monthly Meeting

March 27, 2022, 7:00PM

Baker Wetlands Discovery Center

### Public Observing

March 27, 2022, 8:00PM

Baker Wetlands Discovery Center

### Club Officers

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Rick Heschmeyer [email](#)

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#### Faculty Advisor

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## Report From the Officers

By Rick Heschmeyer

At our February club meeting, Alex Polanski, a Graduate Student with the KU Department of Physics and Astronomy working towards his PhD in Astrophysics, will be giving a presentation entitled "Star Planet Connection: Understanding Exoplanets through the Stars they Orbit". I'd like to also point out that Alex is one of the Graduate Students organizing the "Telescope Nights at KU" events, along with our club's Faculty Adviser, Dr. Jennifer Delgado.

I have a couple of important milestones concerning the club to announce. First, we have a website again! <https://astronaal.ku.edu/>. From this page to can click on the "About AAL →" link at the top of the page to access events, membership information, newsletters, contents and more. Thanks to everyone that works so hard to secure the club a new website.

The other announcement is this year, in 2022, the Astronomy Associates of Lawrence are celebrating our 50th year of existence. Several of our Spring 2021 Zoom Club Meeting speakers were, in fact, members of the club in its early days. We thank them again for presenting last year and bringing us full circle to our golden anniversary.

The February "Telescope Night at KU" was another success. Alex Polanski, our February Club Meeting speaker, started the evening with a talk about the Pleiades Star Cluster for those who attended. Telescope observing followed. The March "Telescope Night at KU" is scheduled for Thursday, March 10. I will forward the event flyer to the club once I receive it.

Our March meeting will take place on Sunday, March 27th at 7:00 PM at the Baker Wetlands Discovery Center. Jerelyn Ramirez of the Kansas Astronomical Observers club in Wichita, and a member of the Library Telescope Task Force, will be giving us an overview of the Library Telescope Program. Public observing will follow the meeting as always, weather permitting.

Looking forward to seeing everyone there.



**Astronomy Associates of Lawrence**

The Celestial Mechanic

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# NASA's Webb Telescope reaches major milestone as mirror unfolds

the thousands of innovators who poured their life's passion into this mission."

The two wings of Webb's primary mirror had been folded to fit inside the nose cone of an Ariane 5 rocket prior to launch.

After more than a week of other critical spacecraft deployments, the Webb team began remotely unfolding the hexagonal segments of the primary mirror, the largest ever launched into space. This was a multi-day process, with the first side deployed Jan. 7 and the second Jan. 8.

Mission Operations Center ground control at the Space Telescope Science Institute in Baltimore began deploying the second side panel of the mirror at 8:53 a.m. EST. Once it extended and latched into position at 1:17 p.m.



SCIENCEDAILY, JANUARY 8, 2022

NASA's James Webb Space Telescope team fully deployed its 21-foot, gold-coated primary mirror, successfully completing the final stage of all major spacecraft deployments to prepare for science operations.

A joint effort with the European Space Agency (ESA) and Canadian Space Agency, the Webb mission will explore every phase of cosmic history -- from within our solar system to the most distant observable galaxies in the early universe.

"Today, NASA achieved another engineering milestone decades in the making. While the journey is not complete, I join the Webb team in breathing a little easier and imagining the future breakthroughs bound to inspire the world," said NASA Administrator Bill Nelson. "The James Webb Space Telescope is an unprecedented mission that is on the precipice of seeing the light from the first galaxies and discovering the mysteries of our universe. Each feat already achieved and future accomplishment is a testament to

EST, the team declared all major deployments successfully completed.

The world's largest and most complex space science telescope will now begin moving its 18 primary mirror segments to align the telescope optics. The ground team will command 126 actuators on the backsides of the segments to flex each mirror -- an alignment that will take months to complete. Then the team will calibrate the science instruments prior to delivering Webb's first images this summer.

"I am so proud of the team -- spanning continents and decades -- that delivered this first-of-its kind achievement," said Thomas Zurbuchen, associate administrator for the Science Mission Directorate in NASA Headquarters in Washington. "Webb's successful deployment exemplifies the best of what NASA has to offer: the willingness to attempt bold and challenging things in the name of discoveries still unknown."

Soon, Webb will also undergo a third mid-course correction burn -- one of three planned to place the telescope precisely in orbit around the second Lagrange point, commonly known as L2, nearly 1 million miles from Earth. This is Webb's final orbital position, where its sunshield will protect it from light from the Sun, Earth, and Moon that could interfere with observations of infrared light. Webb is designed to peer back over 13.5 billion years to capture infrared light from celestial objects, with much higher resolution than ever before, and to study our own solar system as well as distant worlds.

"The successful completion of all of the Webb Space Telescope's deployments is historic," said Gregory L. Robinson, Webb program director at NASA Headquarters. "This is the first time a NASA-led mission has ever attempted to complete a complex sequence to unfold an observatory in space -- a remarkable feat for our team, NASA, and the world."

NASA's Science Mission Directorate oversees the mission. NASA's Goddard Space Flight Center in Greenbelt, Maryland, manages the project for the agency and oversees the Space Telescope Science Institute, Northrop Grumman, and other mission partners. In addition to Goddard, several NASA centers contributed to the project, including Johnson Space Center in Houston, the Jet Propulsion Laboratory in Pasadena, Marshall Space Flight Center in Huntsville, Alabama, Ames Research Center in Silicon Valley, and others. ✱

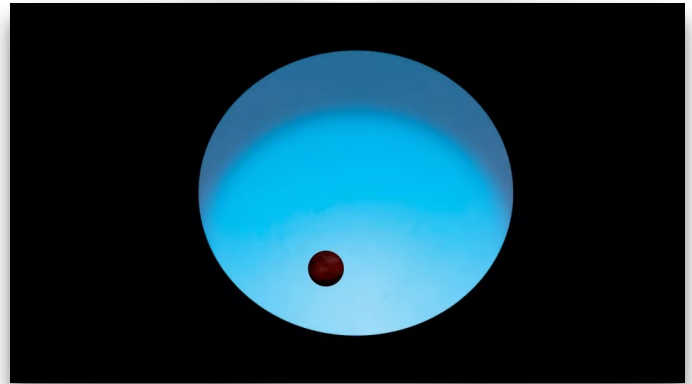
## The Astronomy Photographer of the Year Competition

The *Astronomy Photographer of the Year* contest has been run annually since 2012 by **Royal Museums Greenwich** in the UK and is probably the most prestigious astrophotography competition in the world.

We have gone through the information provided on **376 images from the past three years** (2019, 2020 & 2021) to find out the most used cameras, telescopes, mounts, and star trackers.

You can read more information on the [Methodology](#) in this article and info on the results. ✱

## Bizarre alien planet has layered atmosphere of vaporized metals



By Meghan Bartels

SPACE.COM, JANUARY 31, 2022

Scientists have spotted the first evidence of an alien world with an atmosphere that's layered like Earth's — although perhaps a little too toasty for human tastes.

The planet, dubbed [WASP-189b](#), isn't a new discovery. Scientists already knew that the world, which lies about 322 light-years from Earth, is a gas giant that orbits its star 20 times closer than Earth does the sun, making it a sweltering world. And in a new study of the [exoplanet](#), scientists found the first hint that such a body sports a complex atmosphere like our own.

"In the past, astronomers often assumed that the atmospheres of exoplanets exist as a uniform layer," Jens Hoeijmakers, an astrophysicist at Lund Observatory in Sweden and a co-author on the new research, said in a [statement](#) released by the University of Bern in Switzerland, where some of the scientists are based. "But our results demonstrate that even the atmospheres of intensely irradiated giant gas planets have complex three-dimensional structures."

The research is based on analyzing light from the planet's star, WASP-189, as the world passes in front of it. Specifically, the scientists used observations gathered in 2019 by the High Accuracy Radial Velocity Planet Searcher (HARPS) instrument at La Silla Observatory in Chile during three different passes of the planet in front of its [star](#).

By looking at the ring of light immediately surrounding the planet's shadow, scientists can study the



atmosphere without seeing it directly. In this technique, researchers first determine what wavelengths of starlight don't reach the instrument, then they identify what chemicals absorb that characteristic "fingerprint" of light.

HARPS can't directly distinguish how those chemicals are arranged within an atmosphere and the scientists didn't observe layering firsthand. However, the chemical fingerprints detected are influenced by the same [Doppler effect](#) that makes a siren sound differently when approaching and leaving. In their analysis, the researchers found slightly different Doppler effects among different chemicals, suggesting that they were moving differently through the atmosphere and that it therefore has a complex structure.

"We believe that strong winds and other processes could generate these alterations," Bibiana Prinoth, lead author of the study and doctoral student at Lund University, said in the statement. "And because the fingerprints of different gases were altered in different ways, we think that this indicates that they exist in different layers — similarly to how the fingerprints of water vapor and ozone on Earth would appear differently altered from a distance, because they mostly occur in different atmospheric layers."

Among the specific chemicals the team identified was one of particular interest, titanium oxide, which the researchers think could be absorbing short-wavelength light, as Earth's ozone layer does.

Also in the atmosphere of WASP-189b, according to the new study, are a handful of different metals, including iron, chromium, magnesium and vanadium. While we humans don't usually think of metals as being gaseous, given the temperatures at WASP-189b, it's not surprising. The planet's star is particularly hot, and the planet is so close it takes just 2.7 Earth days to orbit, according to [previous research](#).

"We are convinced that to be able to fully understand these and other types of planets — including ones more similar to Earth — we need to appreciate the three-dimensional nature of their atmospheres," Kevin Heng, an astrophysicist at the University of Bern and co-author on the new research, said in the statement. Fortunately, the newly launched [James Webb Space Telescope](#) is equipped to do this kind of [atmospheric detective work](#) as well. ✧

## Hang Out with the Twins of Gemini

By David Prosper

THE NIGHTSKY NETWORK, JANUARY 2022

The night skies of February are filled with beautiful star patterns, and so this month we take a closer look at another famous constellation, now rising high in the east after sunset: Gemini, the Twins!

If you're observing Orion, as discussed in last month's article, then Gemini is easy to find: just look above Orion's "head" to find Gemini's "feet." Or, make a line from brilliant blue-white Rigel in the foot of Orion, through its distinct "Belt," and then on through orange Betelgeuse. Keep going and you will end up in between the bright stars Castor and Pollux, the "heads" of the Gemini Twins. While not actually related — these stars aren't bound to each other, and are almost a magnitude apart in brightness — they do pair up nicely when compared to their surrounding stars. Take note: more than one stargazer has confused Gemini with its next-door neighbor constellation, Auriga. The stars of Auriga rise before Gemini's, and its brightest star, Capella, doesn't pair up as strikingly with its second most brilliant star as Castor and Pollux do. Star-hop to Gemini from Orion using the trick above if you aren't sure which constellation you're looking at.

Pollux is the brighter of Gemini's two "head" stars — imagine it has the head of the "left twin" — and located about 34 light-years away from our Solar System. Pollux even possesses a planet, Pollux b, over twice the mass of Jupiter. Castor — the head of the "right twin" — by contrast, lies about 51 light-years distant and is slightly dimmer. While no planets have been detected, there is still plenty of company as Castor is actually a six-star system! There are several great deep-sky objects to observe as well. You may be able to spot one with your unaided eyes, if you have dark skies and sharp eyes: M35, a large open cluster near the "right foot" of Gemini, about 3,870 light-years away. It's almost the size of a full Moon in our skies! Optical aid like binoculars or a telescope reveals the cluster's brilliant member stars. Once you spot M35, look around to see if you can spot another open cluster, NGC 2158, much smaller and more distant than M35 at 9,000 light-years away. Another notable object is NGC 2392, a planetary nebula created from the remains of a dying star, located about 6,500 light-

years distant. You'll want to use a telescope to find this intriguing faint fuzzy, located near the "left hip" star Wasat.

Gemini's stars are referenced quite often in cultures around the world, and even in the history of space exploration. NASA's famed Gemini program took its name from these stars, as do the appropriately named twin Gemini North and South Observatories in Hawaii and Chile. You can discover more about Gemini's namesakes along with the latest observations of its stars and related celestial objects at [nasa.gov](https://nasa.gov).



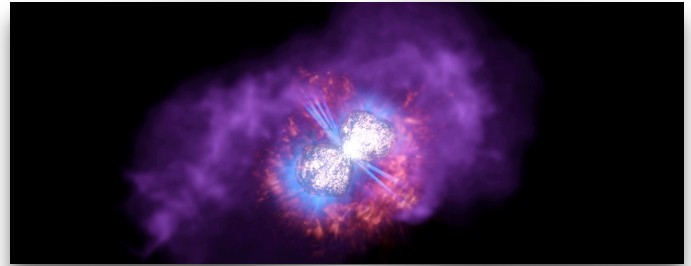
Castor and Pollux are Gemini's most prominent stars, and often referred to as the "heads" of the eponymous twins from Greek myth. In Chinese astronomy, these stars make up two separate patterns: the Vermillion Bird of the South and the White Tiger of the North. What do you see? The Night Sky Network's "Legends in the Sky" activity includes downloadable "Create Your Own Constellation" handouts so you can draw your own star stories: [bit.ly/legendsinthesky](https://bit.ly/legendsinthesky)

#### This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit [nightsky.jpl.nasa.gov](https://nightsky.jpl.nasa.gov) to find local clubs, events, and more! ✧



## VISUALIZATION EXPLORES A MASSIVE STAR'S GREAT ERUPTION



The great eruption of a great star [video](#).

HUBBLESITE, JANUARY 25, 2022

A new astronomical visualization from NASA's Universe of Learning showcases the multiwavelength emissions (from infrared light through X-rays) and three-dimensional structures surrounding Eta Carinae, one of the most massive and eruptive stars in our galaxy. The video, "Eta Carinae: The Great Eruption of a Massive Star," is being released today on [hubblesite.org](https://hubblesite.org) and [universe-of-learning.org](https://universe-of-learning.org).

Eta Carinae, or Eta Car, is famous for a brilliant and unusual outburst, called the "Great Eruption," observed in the 1840s. This briefly made it one of the brightest stars in the night sky, releasing almost as much visible light as a supernova explosion.

The star survived the outburst, and slowly faded away for the next five decades. The primary cause of this brightness change is a small nebula of gas and dust, called the Homunculus Nebula, that was expelled during the blast, and has blocked the light of the star.

Observations using NASA's Hubble Space Telescope and Chandra X-ray Observatory reveal the details in visible, ultraviolet, and X-ray light. Astronomers and artists at the Space Telescope Science Institute (STScI) in Baltimore, Maryland have developed three-dimensional models to represent the hourglass shape of the Homunculus and the clouds of glowing gas that encompass it. The result is a stunning tour of the nested emissions that brings the 2D images to 3D life.

"The team did such an amazing job representing the volumetric layers that viewers can immediately and intuitively comprehend the complex structure around Eta Car," said Frank Summers, principal visualization scientist at STScI and project lead. "We can not only

tell the story of the Great Eruption, but also showcase the resulting nebula in 3D."

In addition, Eta Car is extremely bright at infrared wavelengths, and its radiation impacts the much larger Carina Nebula where it resides. Working with NASA's Spitzer Space Telescope observations, the team was able to place Eta Car in context of the dazzling infrared view of the star-forming region.

"Spitzer's infrared image lets us peer through the dust that obscures our view in visible light to reveal the intricate details and extent of the Carina Nebula around this brilliant star," commented Robert Hurt, lead visualization scientist at Caltech/IPAC and team member.

Extending the goals of NASA's Universe of Learning, the visualization assets promote learning beyond the video sequence. "We can take these models like the one for Eta Car and use them in 3D printing and augmented reality programs," noted Kim Arcand, visualization lead scientist at the Chandra X-ray Center in Cambridge, Massachusetts. "This means more people can put their hands on the data – literally and virtually – and this makes for better learning and engagement."

Eta Carinae is one of the most massive stars known. These exceptional stars are prone to outbursts during their lives. They will end their lives by collapsing into a black hole, probably accompanied by a supernova explosion. Eta Car is one of the nearest and best studied examples for learning about the energetic life and death of very massive stars.

Want to learn more? The visualization video and extensive related resources, which will include an upcoming Universe of Learning online live chat with Summers about the visualization, can be found at <https://universeunplugged.ipac.caltech.edu/video/astroviz-eta-car>.

NASA's Universe of Learning is part of the NASA Science Activation program. The Science Activation program connects NASA science experts, real content and experiences, and community leaders in a way that activates minds and promotes deeper understanding of our world and beyond. Using its direct connection to the science and the experts behind the science, NASA's Universe of Learning provides resources and experiences that enable youth, families, and lifelong learners to explore fundamental questions in science, experience how science is done, and discover the universe for themselves. ✱

## Earth has a second known 'Trojan asteroid' that shares its orbit



By Liz Kruesi

SCIENCENEWS, FEBRUARY 1, 2022

A recently found space rock is schlepping along with Earth around the sun. This "Trojan asteroid" is only the second one discovered that belongs to our planet. And it's probably a visitor.

Trojan asteroids, which are also found accompanying Mars, Jupiter and Neptune, hang out in two [locations near a planet](#) where the gravitational pulls of that planet and the sun balance each other (SN: 10/15/21). Because of this balancing act, these locations are stable spots in space. In 2010, astronomers [discovered the first known Earth Trojan](#) — called 2010 TK7 — orbiting within one of these two regions, known as L4, tens of millions of kilometers from Earth and leading our planet around the sun (SN: 8/2/11).

Now, [researchers have found another one](#). Dubbed 2020 XL5, this roughly 1-kilometer-wide asteroid is also at L4, astronomer Toni Santana-Ros of the University of Barcelona and colleagues report February 1 in *Nature Communications*.

The space rock was first spotted in December 2020, and follow-up observations suggested that it might be at L4. To confirm this, Santana-Ros and colleagues observed the asteroid using ground-based telescopes in 2021. Measurements of its brightness let the researchers estimate the asteroid's size — about three to four times as wide as 2010 TK7. They also scoured archival data and found the object in images dating to 2012.

"There is no doubt this is an Earth Trojan," Santana-Ros says. That decade-worth of observations let the team calculate the rock's orbit thousands of years into the future, confirming the asteroid's nature. It will hang around at L4 for at least 4,000 years, the team predicts. 2010 TK7, for comparison, will stick around for some 10,000 years.

Now that scientists know of two just-visiting Earth Trojans, they can envision more. The fact that the team discovered a second object means that 2010 TK7 isn't a rarity or loner, Santana-Ros says. "It might be part of a family or population." \*

## How Mars lost its oceans

SCIENCEDAILY, FEBRUARY 8, 2023

Whether it's due to science fiction or the fact that you can see it with your own eyes from Earth, Mars has captured the imagination of people for centuries. It's one of the closest planets to us and has been studied with all manner of scientific instruments aboard the various unmanned space probes that have explored it and continue to do so. Yet, despite this, there are some big unanswered questions about Mars -- the answers to which could even shed light on our own distant past and future, given that Earth, Mars and all our neighboring planets were born of the same cosmic stuff.

Some big questions about Mars have already been answered. For example, we know that many visible features of Mars are proof it used to have oceans and a protective magnetic field. But one question in particular had been on the mind of Professor Kei Hirose from the University of Tokyo's Department of Earth and Planetary Science: There must have been a magnetic field around Mars, so why was it there at all, and why was it there so briefly? Compelled to answer this question, a team led by Ph.D. student Shunpei Yokoo in the Hirose lab explored a novel way to test something so distant from us in both time and space.

"Earth's magnetic field is driven by inconceivably huge convection currents of molten metals in its core. Magnetic fields on other planets are thought to work the same way," said Hirose. "Though the internal composition of Mars is not yet known, evidence from meteorites suggests it is molten iron enriched with sulphur. Furthermore, seismic readings from NASA's InSight probe on the surface tell us Mars' core is larger and less dense than previously thought. These

things imply the presence of additional lighter elements such as hydrogen. With this detail, we prepare iron alloys that we expect constitute the core and subject them to experiments."

The experiment involved diamonds, lasers, and an unexpected surprise. Yokoo made a sample of material containing iron, sulphur and hydrogen, Fe-S-H, which is what he and his team expect the core of Mars was once made from. They placed this sample between two diamonds and compressed it while heating it with an infrared laser. This was to simulate the estimated temperature and pressure at the core. Sample observations with X-ray and electron beams allowed the team to image what was going on during melting under pressure, and even map how the composition of the sample changed during that time.

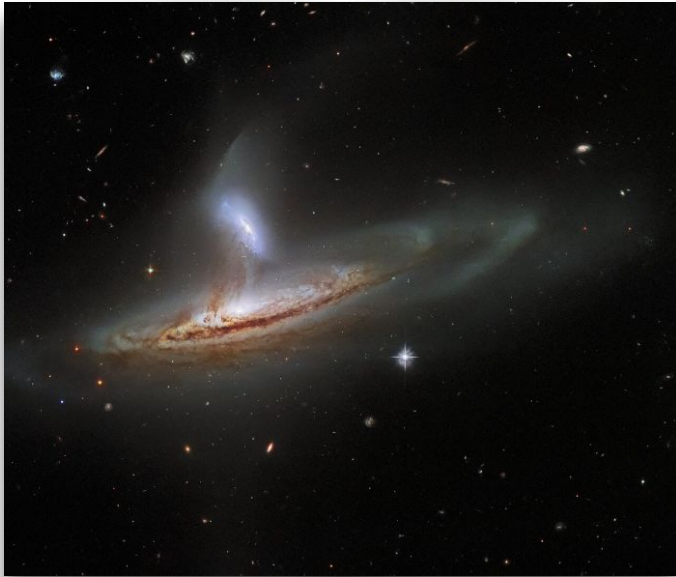
"We were very surprised to see a particular behavior that could explain a lot. The initially homogeneous Fe-S-H separated out into two distinct liquids with a level of complexity that has not been seen before under these kinds of pressures," said Hirose. "One of the iron liquids was rich in sulphur, the other rich in hydrogen, and this is key to explaining the birth and eventually death of the magnetic field around Mars."

The liquid iron rich in hydrogen and poor in sulphur, being less dense, would have risen above the denser sulphur-rich, hydrogen-poor liquid iron, causing convection currents. These currents, similar to those on Earth, would have driven a magnetic field capable of maintaining hydrogen in an atmosphere around Mars, which in turn would have allowed water to exist as a liquid. However, it was not to last. Unlike the Earth's internal convection currents which are extremely long lasting, once the two liquids had fully separated, there would have been no more currents to drive a magnetic field. And when that happened, hydrogen in the atmosphere was blown out to space by solar wind, leading to the breakdown of water vapor and eventually the evaporation of the Martian oceans. And this would all have taken place about 4 billion years ago.

"With our results in mind, further seismic study of Mars will hopefully verify the core is indeed in distinct layers as we predict," said Hirose. "If that is the case, it would help us complete the story of how the rocky planets, including Earth, formed, and explain their composition. And you might be thinking that the Earth could one day lose its magnetic field as well, but don't worry, that won't happen for at least a billion years." \*



# Sublime New Hubble Image Reveals a Thrilling Exchange Between Two Galaxies



By Michelle Starr

SCIENCEALERT, FEBRUARY 15, 2023

The ongoing interaction between two galaxies 320 million light-years away has been captured in a gorgeous Hubble image.

They're collectively known as Arp 282 in Halton Arp's [Atlas of Peculiar Galaxies](#), and they consist of a large [barred spiral galaxy](#) named NGC 169, about [140,000 light-years across](#), and a much smaller [polar-ring galaxy](#) named IC 1559, which is about 40,000 light-years across.

These two galaxies have drawn close enough together that they're exchanging material. That's not unusual: Although space is vast and mostly empty, galaxies are gravitationally drawn together, perhaps [channeled along strands of the invisible cosmic web](#) that stretches across and plays a vital role in shaping the Universe.

Interactions between galaxies significantly contribute to their evolution, whether it's just a flyby that sees an exchange of material, or a full-on merger, as has happened multiple times over the [Milky Way's history](#).



Click [here](#) to see video.

We can try to understand these interactions by finding pairs or groups of galaxies that are in the throes of these processes, and conducting simulations to piece together how they occurred. That's why images like Hubble's latest release are so important.

There are a few notable facets of the interaction between NGC 169 and IC 1559. First, both galaxies have an active galactic nucleus; that is, the supermassive [black holes](#) at the core of each are actively gobbling down dust and gas. This [process](#) produces a lot of high-energy light in the form of X-rays, and heat in infrared wavelengths; Hubble's image is in optical light, which dust in galactic nuclei tends to obscure.

In addition, you can clearly see streams of dust and glowing material passing between the two galaxies, likely from the lower-mass object to the higher-mass object.

These interactions can [change a galaxy's shape](#), or trigger shock waves that ignite star formation, effectively [reviving](#) a galaxy whose star formation rates are flagging.

"When two galaxies interact, gas, dust and even entire solar systems will be drawn away from one galaxy towards the other by these tidal forces," [the ESA explained](#).

"This process can actually be seen in action in this image – delicate streams of matter have formed, visibly linking the two galaxies."

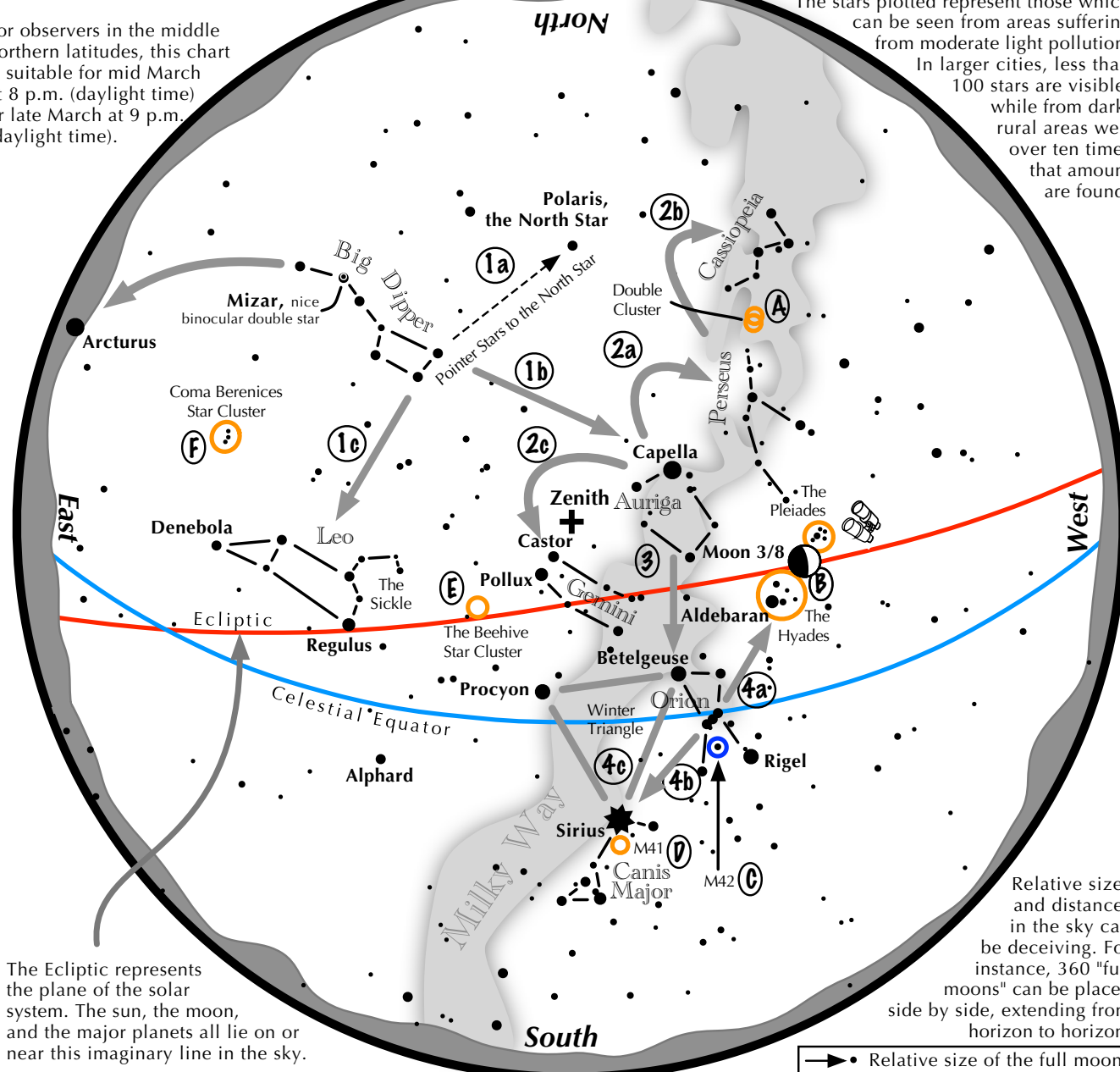
If the two galaxies draw close enough together, eventually they'll merge, their supermassive black holes coming together in a massive event that will send [gravitational waves](#) rippling across the Universe.\*



# Navigating the mid to late March Night Sky

For observers in the middle northern latitudes, this chart is suitable for mid March at 8 p.m. (daylight time) or late March at 9 p.m. (daylight time).

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.



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

- 1 Above the northeast horizon rises the Big Dipper. Draw a line from its two end bowl stars upwards to the North Star. Its top bowl stars point west to Capella in Auriga, nearly overhead. Leo reclines below the Dipper's bowl.
- 2 From Capella jump northwestward along the Milky Way to Perseus, then to the "W" of Cassiopeia. Next jump southeastward from Capella to the twin stars of Castor and Pollux in Gemini.
- 3 Directly south of Capella stands the constellation of Orion with its three Belt Stars, its bright red star Betelgeuse, and its bright blue-white star Rigel.
- 4 Use Orion's three Belt stars to point northwest to the red star Aldebaran and the Hyades star cluster, then to the Pleiades star cluster. Travel southeast from the Belt stars to the brightest star in the night sky, Sirius. It is a member of the Winter Triangle.

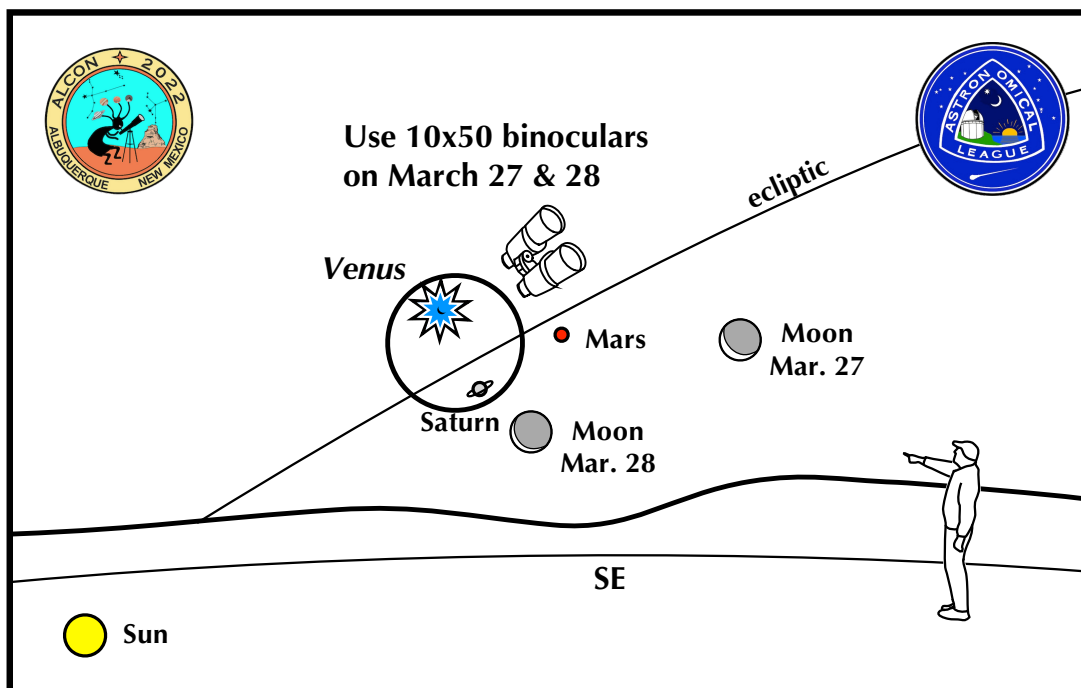
### Binocular Highlights

**A:** Between the "W" of Cassiopeia and Perseus lies the Double Cluster. **B:** Examine the stars of the Pleiades and Hyades, two naked eye star clusters. **C:** M42 in Orion is a star forming nebula. **D:** Look south of Sirius for the star cluster M41. **E:** M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux. **F:** Look high in the east for the loose star cluster of Coma Berenices.



Astronomical League [www.astroleague.org/outreach](http://www.astroleague.org/outreach); duplication is allowed and encouraged for all free distribution.

**If you can see only one celestial event in the morning this March, see this one.**



### **Crescent Moon passes Venus, Mars & Saturn**

- Look in the east-southeast beginning 75 minutes before sunrise on March 27 & 28.
- Venus shines brightly low above the east-southeastern horizon.
- On Mar. 27, Mars lies about 1 binocular field to the right of Venus and Saturn lies in the same field as Venus, but to its lower right. The very thin crescent moon, full with earthshine, glows to the planetary trio's right.
- On the following morning, an even thinner moon floats below Saturn and Mars. Saturn should be slightly brighter than reddish Mars.

### **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](#).