Volume 51 Number 5 May 2025

The Celestial Mechanic

The Official Newsletter of the Astronomy Associates of Lawrence

Coming Events

Monthly Meeting
No Meeting This Month
Baker Wetlands Discovery Center

Public Observing
No Public 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

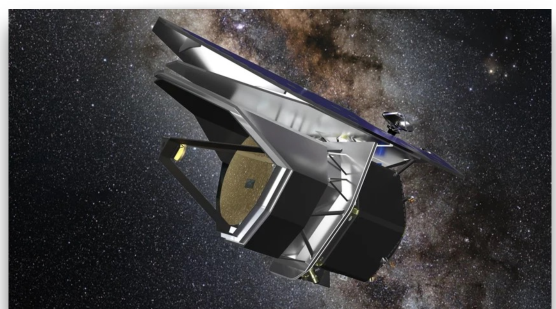
Report From the Officers

By Rick Heschmeyer

The spring weather has not been very conducive to observer so far, but I hope some of you were able to get out in the early morning in April to see the newly discovered Comet C2025/F2 (SWAN) before it disintegrated as it looped around the Sun. While I tried, I was unsuccessful.

Baker Wetlands Discovery Center held their annual Family Fun Day on April 12. AAL was represented by Bill Wachspress and Dr. Barbara Anthony-Twarog.

Our April club meeting featured Dr. Elisabeth Mills of the University of Kansas. She discussed her participation as a Co-Investigator in the proposed PRIMA Mission (The PRobe far-Infrared Mission for Astrophysics). The hope is that this spacecraft will fly in the 2030 decade.



This was our final club meeting of the spring. We have been discouraged the past couple of years by the low attendance at our post-City Band Concert events in South Park so we are looking at other observing opportunities for this summer.

The first of these events scheduled will be another "Stargazing at the Station" event at the KU Field Station on the evening of May 23rd (with a rain date of May 24th if needed). Our "Stargazing at the Station" event at the end of February drew over 50 participants! Hopefully we will have one or two additional events at the Field Station later this summer. More to come.

We have also scheduled a Solar Observing event at the Spencer Museum of Art on June 5 from 4-6 pm. Let me know if you would be interested in helping with this event. If you have any other ideas for summer events please share.

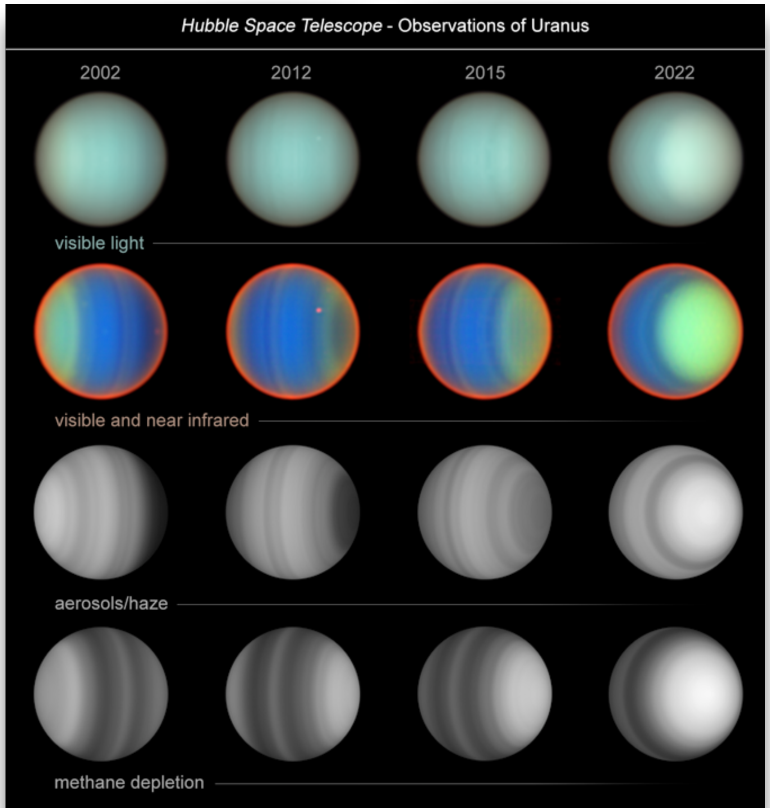
The final spring KU Public Telescope Night is scheduled for Thursday, May 8, 2025. Observing will take place on the south side of Slawson Hall at 7:30 PM. The two planetarium shows will take place in G174 Slawson and will start at 7:30 and 8:00 PM.

Looking forward to seeing everyone at our summer events.

Clear Skies!

20-Year Hubble Study of Uranus Yields New Atmospheric Insights

HUBBLESITE, MARCH 31, 2025



Summary

Uranus findings can aid the study of exoplanets.

Halfway through its fourth decade, Hubble's long life has proven invaluable for studying the atmosphere of the mysterious ice giant Uranus. By repeatedly training Hubble on the distant cyan planet over the course of 20 years, researchers chronicled a two-decade story of seasonal changes. These astronomers have gained new understanding of the atmospheric dynamics of Uranus, which can serve as a proxy for studying exoplanets of similar size and composition.

The ice-giant planet Uranus, which travels around the Sun tipped on its side, is a weird and mysterious world. Now, in an unprecedented study spanning two decades, researchers using NASA's Hubble Space Telescope have uncovered new insights into the planet's atmospheric composition and dynamics. This was possible only because of Hubble's sharp resolution, spectral capabilities, and longevity.

The team's results will help astronomers to better understand how the atmosphere of Uranus works and responds to changing sunlight. These long-term observations provide valuable data for understanding the atmospheric dynamics of this distant ice giant, which can serve as a proxy for studying exoplanets of similar size and composition.

When Voyager 2 flew past Uranus in 1986, it provided a close-up snapshot of the sideways planet. What it saw resembled a bland, blue-green billiard ball. By comparison, Hubble chronicled a 20-year story of seasonal changes from 2002 to 2022. Over that period, a team led by Erich Karkoschka of the University of Arizona, and Larry Sromovsky and Pat Fry from the University of Wisconsin used the same Hubble instrument, STIS (the Space Telescope Imaging Spectrograph), to paint an accurate picture of the atmospheric structure of Uranus.

Uranus' atmosphere is mostly hydrogen and helium, with a small amount of methane and traces of water and ammonia. The methane gives Uranus its cyan color by absorbing the red wavelengths of sunlight.

The Hubble team observed Uranus four times in the 20-year period: in 2002, 2012, 2015, and 2022. They found that, unlike conditions on the gas giants Saturn and Jupiter, methane is not uniformly distributed across Uranus. Instead, it is strongly depleted near the poles. This depletion remained relatively constant over the two decades. However, the aerosol and haze structure changed dramatically, brightening significantly in the northern polar region as the planet approaches its northern summer solstice in 2030.

Uranus takes a little over 84 Earth years to complete a single orbit of the Sun. So, over two decades, the Hubble team has only seen mostly northern spring as the Sun moves from shining directly over Uranus' equator toward shining almost directly over its north pole in 2030. Hubble observations suggest complex atmospheric circulation patterns on Uranus during this period. The data that are most sensitive to the methane distribution indicate a downwelling in the polar regions and upwelling in other regions.

The team analyzed their results in several ways. The image columns show the change of Uranus for the four years that STIS observed Uranus across a 20-year period. Over that span of time, the researchers watched the seasons of Uranus as the south polar region (left) darkened going into winter shadow while the north polar region (right) brightened as it began to come into a more direct view as northern summer approaches.

The top row, in visible light, shows how the color of Uranus appears to the human eye as seen through even an amateur telescope.

In the second row, the false-color image of the planet is assembled from visible and near-infrared light observations. The color and brightness correspond to the amounts of methane and aerosols. Both of these quantities could not be distinguished before Hubble's STIS was first aimed at Uranus in 2002. Generally, green areas indicate less methane than blue areas, and red areas show no methane. The red areas are at the limb, where the stratosphere of Uranus is almost completely devoid of methane.

The two bottom rows show the latitude structure of aerosols and methane inferred from 1,000 different wavelengths (colors) from visible to near infrared. In the third row, bright areas indicate cloudier conditions, while the dark areas represent clearer conditions. In the fourth row, bright areas indicate depleted methane, while dark areas show the full amount of methane.

At middle and low latitudes, aerosols and methane depletion have their own latitudinal structure that mostly did not change much over the two decades of observation. However, in the polar regions, aerosols and methane depletion behave very differently.

In the third row, the aerosols near the north pole display a dramatic increase, showing up as very dark during early northern spring, turning very bright in recent years. Aerosols also seem to disappear at the left limb as the solar radiation disappeared. This is evidence that solar radiation changes the aerosol haze in the atmosphere of Uranus. On the other hand, methane depletion seems to stay quite high in both polar regions throughout the observing period.

Astronomers will continue to observe Uranus as the planet approaches northern summer. ☀

Einstein Didn't Think This Stunning Picture Was Possible. We're Glad He Was Wrong.

By Brian Koberlein

SCIENCEALERT, APRIL 1 2025

Stunning Einstein ring captured by the JWST.

One of the first verified predictions of general relativity is the gravitational deflection of starlight.

The effect was first observed in 1919 during a total solar eclipse. Since stars appear as points of light, the effect is seen as an apparent shift in the position of stars near the eclipse.

But the effect happens more generally. If a distant galaxy is obscured by a closer one, some of the distant light is gravitationally lensed around the closer galaxy, giving us a warped and distorted view of the faraway stars.

This effect can also magnify the distant galaxy, making its light appear brighter, and we have used this effect to observe some of the most distant stars in the Universe.

But perhaps the most beautiful effect of gravitational lensing is what's known as an Einstein Ring. This is where the distant galaxy is so perfectly centered behind the closer galaxy that its light is distorted into a circle of light.

Einstein was aware of the effect but said in 1936 that "there is no hope of observing this phenomenon directly." But as brilliant as Einstein was, he couldn't imagine the power of modern telescopes.

We have now found dozens of Einstein rings, and one of the more beautiful examples was recently found by JWST, as seen in the image above.

The close galaxy in the foreground is an elliptical galaxy that's part of a large cluster known as SMACS J0028.2-7537. The more colorful galaxy warped around it is a spiral galaxy similar to the Milky Way. It is billions of years more distant, but perfectly aligned to create the almost perfect ring.

Of course, this image is only possible because of our vantage point. Astronomers in other galaxies wouldn't catch such a wondrous image.

Yet another astronomical example of how beauty is not only in the eye of the beholder, but also where that beholder is. ☀

This star burped after eating a planet — but the planet was really asking for it

By Keith Cooper
SPACE.COM, APRIL 10, 2025

The planet "splashed down" into the star, sending a giant plume of gas into space that gave the star a ring.

The James Webb Space Telescope (JWST) has been studying the scene of a dramatic collision between a star and its planet, but whereas astronomers had originally thought that the star was a red giant that engulfed the planet, the JWST has found a very different story: The planet crashed into the star.

In 2020, the Zwicky Transient Facility at Palomar Observatory in California spotted a distant star — that sits about 12,000 light-years away from us — suddenly brighten in the night sky. When looking back at the star in archival data from NASA's NEOWISE mission, astronomers found that the star, designated ZTF SLRN-2020, had been brightening in infrared light for a year before the optical flash.

A study from 2023 concluded that ZTF SLRN-2020 was an evolved sun-like star called a "red giant" that had expanded, in the process engulfing a gas giant planet orbiting around it. The flash of light was then interpreted as the planet being destroyed as it was consumed by the growing red giant; the infrared brightening was believed to be caused by dust left over as the planet effectively burned up in the red giant's atmosphere, much like a giant meteor.

However, a team led by Ryan Lau of the National Science Foundation's NOIRLab in Tucson, Arizona, chose to take a closer look at ZTF SLRN-2020 using the JWST.

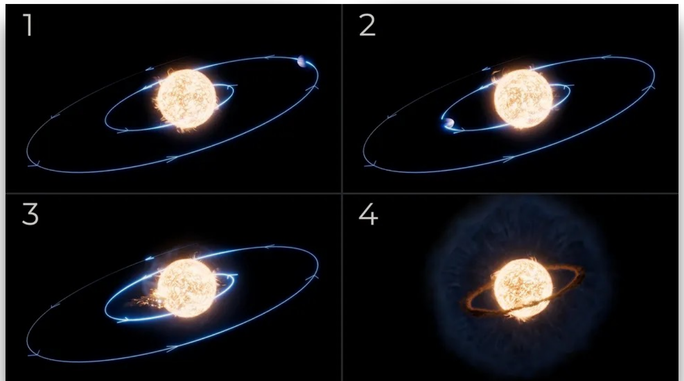
"Because this is such a novel event, we didn't quite know what to expect when we decided to point this telescope in its direction," said Lau in a statement. "With its high-resolution look in the infrared, we are learning valuable insights about the final fates of planetary systems, possibly including our own."

What Lau's team found was a surprise: The star wasn't bright enough to be a red giant. Instead, it looked like a "regular" star with about 70% of the mass of our sun. This, of course, changes the story of ZTF SLRN-2020. If the planet in this system wasn't consumed by a red giant, then the opposite is the only explanation: The planet must have crashed into the star instead.

How can this happen? Well, right from the very first exoplanet discoveries, astronomers have been finding bizarre worlds called hot Jupiters. These are gas giants that formed far from their star and then migrated inwards. This particular planet must have migrated so close to its parent star that, over time, gravitational tides began to pull the planet inexorably to its doom.

"The planet eventually started to graze the star's atmosphere. Then it was a runaway process of falling in faster from that moment," said Morgan MacLeod of the Harvard–Smithsonian Center for Astrophysics and the Massachusetts Institute of Technology. "The planet, as it's falling in, started to sort of smear around the star."

The tidal forces began to stretch the planet in a vice-like grip, until finally the planet "splashed down" into the gases of the star, and as the star swallowed the planet it belched out a tidal wave of gas into space. This ejected plume cooled and condensed into a cloud of gas, instigating the infrared brightening seen by NEOWISE.



Four diagrams showing the planet gradually spiraling closer to its star until it collides, sending a plume of gas into space that eventually forms a ring around the star.

But there was one more surprise. Astronomers had expected to see an amorphous cloud of gas, but the JWST's Near-Infrared Spectrometer instead found a disk of molecular gas encircling the star at close proximity. The disk looks for all the world like a miniature planet-forming disk.

"I could not have expected seeing what has the characteristics of a planet-forming region, even though planets are not forming here, in the aftermath of an engulfment," exoplanet astronomer Colette Salyk of Vassar College in New York said in the statement.

The disk is thought to be composed of some of the ejected gas plume that fell back towards the star, but the details are still sketchy. However, given that this is only the first of hopefully many similar planet-star collision events to be observed, it may be that we'll find the answers in another doomsday system. The in-depth, wide-field surveys of the forthcoming Vera C. Rubin Observatory (which sees first light this year) and NASA's Nancy Grace Roman Space Telescope are expected to find many other similar events that astronomers can follow up on with the JWST. ☀

Physicists claim to have found the first true evidence supporting string theory

By Joshua Hawkins

BGR, April 12, 2025

A new theoretical study suggests that the mysterious force driving the accelerated expansion of the universe—known as dark energy—may actually be rooted in a deeply quantum structure of space-time. This new preprint study could finally provide us with long-sought-after evidence of string theory.

Since its surprise discovery in the late 1990s, dark energy has baffled researchers. Originally thought to be a constant vacuum energy spread throughout space, newer observations from the Dark Energy Spectroscopic Instrument (DESI) revealed that this acceleration may be slowing over time—a result the Standard Model of particle physics can't explain.

That mystery led a team of physicists to explore a more radical solution: maybe dark energy isn't just something filling space. Maybe it's baked into the very nature of space and time itself. The team applied string theory to describe space-time not as a smooth continuum but as a quantum structure where the order of coordinates matters.

The implications here are shocking, to say the least. When modeled this way, space-time naturally gives rise to cosmic acceleration, and what could be crucial evidence of string theory is the data that suggests the acceleration decreases over time, just as DESI data shows.

If validated, this would represent the first tangible evidence of string theory ever observed. The theory has long been criticized for being mathematically elegant but experimentally unprovable. However, the research now connects the universe's expansion rate to two extreme ends of the size spectrum: the minuscule Planck length and the vast scale of the cosmos.

That kind of bridge between the quantum and the cosmic is rare and potentially revolutionary for explaining our universe at its most basic levels. The findings also suggest that the core properties of the universe may not be constant after all, hinting at a

Some theories suggest black holes may be driving the universe's expansion.

deeper connection between gravity and quantum mechanics.

If this holds true, it would mark a fundamental shift in how we understand space-time itself and how dark energy works, not to mention offering something the field has long lacked: observational evidence of string theory.

The researchers aren't stopping here, though. They've proposed tabletop experiments to detect novel quantum interference patterns, which could provide another line of evidence. These tests could arrive within just a few years, and they offer an exciting chance to turn theoretical physics into something truly tangible. ☀

Neutrinos Have No Business Being This Freaking Small

A new measurement finds the universe's teensiest particles weigh no more than one-millionth the mass of an electron.

By Isaac Schultz

Gizmodo, April 13, 2025

Physicists have placed a new limit on how big the elusive neutrino can be—one of the universe's smallest known particles—a limit that makes other subatomic particles look as big as black holes by comparison.

In a new result published this week in Science, researchers have put a new upper limit on the mass of this itsy-bitsy particle: no more than 0.45 electron volts (eV). For context, that's less than one-millionth the mass of an electron, which clocks in at a comparatively gargantuan 511,000 eV. So, yeah—neutrinos are *ridiculously* lightweight.

Trillions of neutrinos pass through your body every second, but they are so small and so weakly interacting that you don't feel a thing.

Neutrinos are the only known elementary particles whose mass remains unknown, though questions remain about how well those elementary particles cooperate with the Standard Model. Determining the neutrino's mass with precision could offer profound insights into the universe's laws. Are neutrinos getting their mass from the Higgs boson, as other particles do? Or is there some entirely new mechanism at play?

Enter the Karlsruhe Tritium Neutrino Experiment, or KATRIN, a 75-foot-long (23-meter-long) blimp-shaped vacuum chamber. Scientists monitor the radioactive decay of tritium inside the vacuum chamber; as the tritium decays, it spits out electrons and antineutrinos. Researchers can't measure the antineutrinos directly (they ghost through matter like it's nothing), but they can (and do) study the leftover electron's energy to make inferences about the mass of the missing particles.

After analyzing 259 days of data, the KATRIN team was able to cut their previous best estimate for the neutrino's mass (0.8 eV) nearly in half. But they're not finished; by the time the full 1,000-day dataset is crunched, the team hopes to push that mass limit down to 0.3 eV, maybe even 0.2 eV.

Neutrinos still have plenty of tricks up their subatomic sleeves. As physicist Susanne Mertens from the Max Planck Institute puts it, the KATRIN Collaboration's measurement could be a backdoor into new physics—and possibly a better understanding of how the early universe evolved.

In February, a different team detected the most energetic neutrino (also called "ghost particles" for their enigmatic nature) deep in the Mediterranean Sea, indicating that the particles may be emitted by interactions between matter and the cosmic microwave background—the oldest visible light in the universe.

If the neutrino mass were more—around one electronvolt—KATRIN could have found its actual value. But with the particle being so freaking small, a new and improved detector—KATRIN++—may be required to measure its mass with precision.

Few things in life are certain, but among the things we can reliably expect are death, taxes, and the neutrino being smaller than ever. ☀

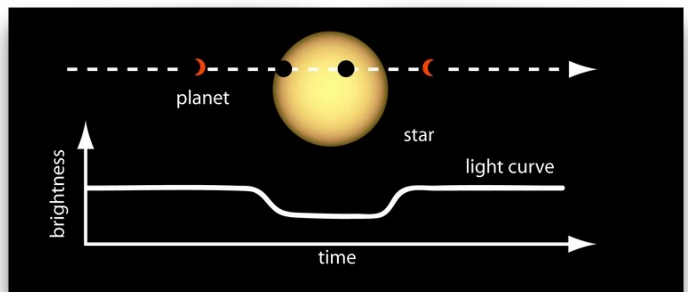
May's Night Sky Notes: How Do We Find Exoplanets?

By Dave Prosper

NIGHTSKYNETWORK, MAY 2025

Astronomers have been trying to discover evidence that worlds exist around stars other than our Sun since the 19th century. By the mid-1990s, technology finally caught up with the desire for discovery and led to the first discovery of a planet orbiting another sun-like star, Pegasi 51b. Why did it take so long to discover these distant worlds, and what techniques do astronomers use to find them?

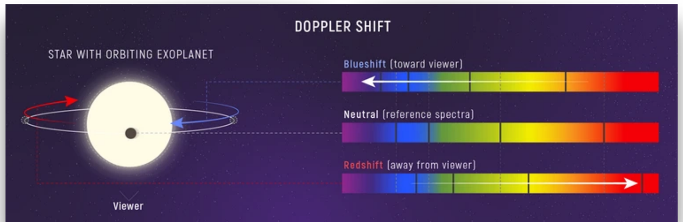
The Transit Method



A planet passing in front of its parent star creates a drop in the star's apparent brightness, called a transit. Exoplanet Watch participants can look for transits in data from ground-based telescopes, helping scientists refine measurements of the length of a planet's orbit around its star.

One of the most famous exoplanet detection methods is the transit method, used by Kepler and other observatories. When a planet crosses in front of its host star, the light from the star dips slightly in brightness. Scientists can confirm a planet orbits its host star by repeatedly detecting these incredibly tiny dips in brightness using sensitive instruments. If you can imagine trying to detect the dip in light from a massive searchlight when an ant crosses in front of it, at a distance of tens of miles away, you can begin to see how difficult it can be to spot a planet from light-years away! Another drawback to the transit method is that the distant solar system must be at a favorable angle to our point of view here on Earth – if the distant system's angle is just slightly askew, there will be no transits. Even in our solar system, a transit is very rare. For example, there were two transits of Venus visible across our Sun from Earth in this century. But the next time Venus transits the Sun as seen from Earth will be in the year 2117 – more than a century from now, even though Venus will have completed nearly 150 orbits around the Sun by then!

The Wobble Method



As a planet orbits a star, the star wobbles. This causes a change in the appearance of the star's spectrum called Doppler shift. Because the change in wavelength is directly related to relative speed, astronomers can use Doppler shift to calculate exactly how fast an object is moving toward or away from us. Astronomers can also track the Doppler shift of a star over time to estimate the mass of the planet orbiting it.

Spotting the Doppler shift of a star's spectra was used to find Pegasi 51b, the first planet detected around a Sun-like star. This technique is called the **radial velocity or "wobble" method.** Astronomers split up the visible light emitted by a star into a rainbow. These spectra, and gaps between the normally smooth bands of light, help determine the elements that make up the star. However, if there is a planet orbiting the star, it causes the star to wobble ever so slightly back and forth. This will, in turn, cause the lines within the spectra to shift ever so slightly towards the blue and red ends of the spectrum as the star wobbles slightly away and towards us. This is caused by the blue and red shifts of the planet's light. By carefully measuring the amount of shift in the star's spectra, astronomers can determine the size of the object pulling on the host star and if the companion is indeed a planet. By tracking the variation in this periodic shift of the spectra, they can also determine the time it takes the planet to orbit its parent star.

Direct Imaging

Finally, exoplanets can be revealed by directly imaging them, such as this image of four planets found orbiting the star HR 8799! Space telescopes use instruments called coronagraphs to block the bright light from the host star and capture the dim light from planets. The Hubble Space Telescope has captured images of giant planets orbiting a few nearby systems, and the James Webb Space Telescope has only improved on these observations by uncovering more details, such as the colors and spectra of exoplanet atmospheres, temperatures, detecting potential exomoons, and even scanning atmospheres for potential biosignatures!

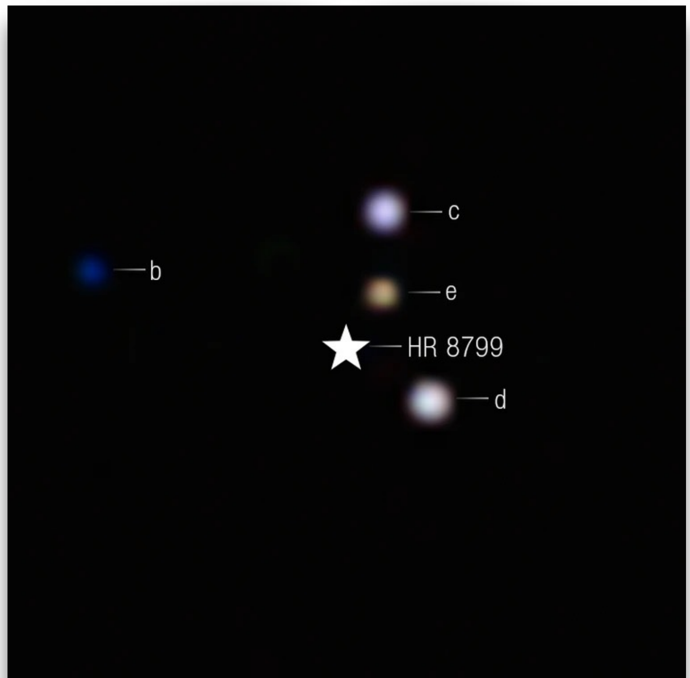


Image taken by the James Webb Space Telescope of four exoplanets orbiting HR 8799.

You can find more information and activities on NASA's Exoplanets page, such as the Eyes on Exoplanets browser-based program, The Exoplaneteers, and some of the latest exoplanet news. Lastly, you can find more resources in our News & Resources section, including a clever demo on how astronomers use the wobble method to detect planets!

The future of exoplanet discovery is only just beginning, promising rich rewards in humanity's understanding of our place in the Universe, where we are from, and if there is life elsewhere in our cosmos. ☀

The Backyard Observer, May 2025

By Rick Heschmeyer

CANES VENATICI

Characteristic of the night springtime night sky, this month's feature constellation CANES VENATICI, the Hunting Dogs, contains several galaxies within the reach of small and medium amateur telescopes. Throw in some nice double stars and a globular cluster and this small constellation is packed with objects worth observing. Located between Boötes and Ursa Major, Canes Venatici was first defined as a separate constellation by the 17th Century Polish astronomer Johannes Hevelius. We will start our tour with the constellation's only bright star.

Alpha Canum Venaticorum is more commonly referred to as Cor Caroli, the "Heart of Charles". This name cam from the English astronomer Sir Edmund Halley (of comet fame) in honor of King Charles II, this star is a fine double star for owners of small telescopes. If it exists at all, the color contrast of the two components is slight indeed. If fact most observers simply describe both stars as white or bluish-white. Cor Caroli represents the dog Chara is mythological depictions of the constellation. The other dog, Asterion, is marked by the Beta Canum Venaticorum.

2 Canum Venaticorum is a bright, easy pair for small telescopes that shows a clear color contrast. The two stars emit yellow-orange and powder blue colors.

Y Canum Venaticorum is located between Cor Caroli and the stars of the "Big Dipper" asterism. It is a deep red colored variable star also known as "La Superba". Being on of the reddest of all naked-eye stars, it is a giant carbon star, and it can be located without trouble north and a bit east of Beta CVN.

Messier 3, the third object catalogues by Charles Messier for his now famous list of nebulous objects, was discovered by Messier on May 3, 1764. This is one of the finest globular clusters in the northern night sky. Visible in binoculars as a nebulous glow, small telescopes will reveal several stars around the periphery of the cluster. Eight inch or larger instruments are required to inspect the brighter stars within the cluster. At Messier 3's current estimated distance the light from a star at one outer edge of the globular would take over 200 years just to cross over to the opposite side!

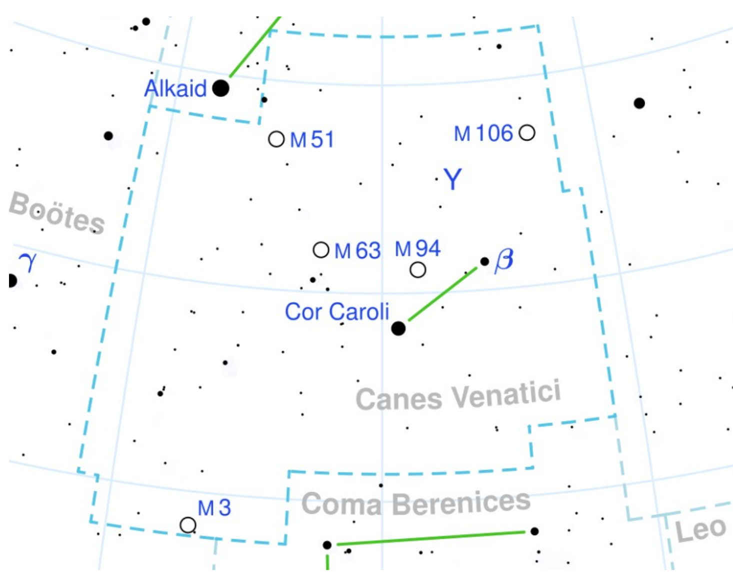
Messier 51 should be familiar to most astronomy enthusiasts. Anyone who has read an astronomy book has most likely seen an image of the galaxy, also known as the Whirlpool Galaxy. Located a few degrees southwest of the last star in the handle of the Big Dipper asterism, this beautiful face-on spiral galaxy is interacting with a companion galaxy **NGC 5195** must be one of the most photographed galaxies in the night sky. Some observers have seen the glow of both galaxies in binoculars from dark sites. Small and medium aperture telescopes make the nuclear regions of both galaxies readily observable. A dark site is needed to view the spiral arms of Messier 51, which in smaller telescopes appears more like a faint halo surrounding the nucleus. Messier 51 was the first galaxy in which spiral structure was recognized. The discovery was made is 1845 by British amateur astronomer William Parson, Third Earl of Rosse, using his home built 72 inch reflecting telescope, dubbed the "Leviathan of Parsonstown."

Messier 63, also known as the "Sunflower Galaxy", can be found midway between the end star of the Big Dipper's handle and Cor Caroli. Small telescopes show only the bright central region of the galaxy, which is oval in shape.

Messier 94 is a bright, very compact spiral galaxy. It appears as a small, bright circular object in amateur telescopes. In fact, it resembles the nucleus of a bright comet through small instruments.

Messier 106 is another spiral galaxy. Charles Messier's original catalogue contained only 103 entries, but several other objects were logged by Messier and his friend and associate Pierre Méchain, and were added to his catalogue posthumously, bringing the catalogue to the 110 objects that we know today. This galaxy was one of those late additions. It appears distinctly oval in shape due to the tilt of the galaxy's plane to our line of sight. The central region of the galaxy can be seen in small telescopes.

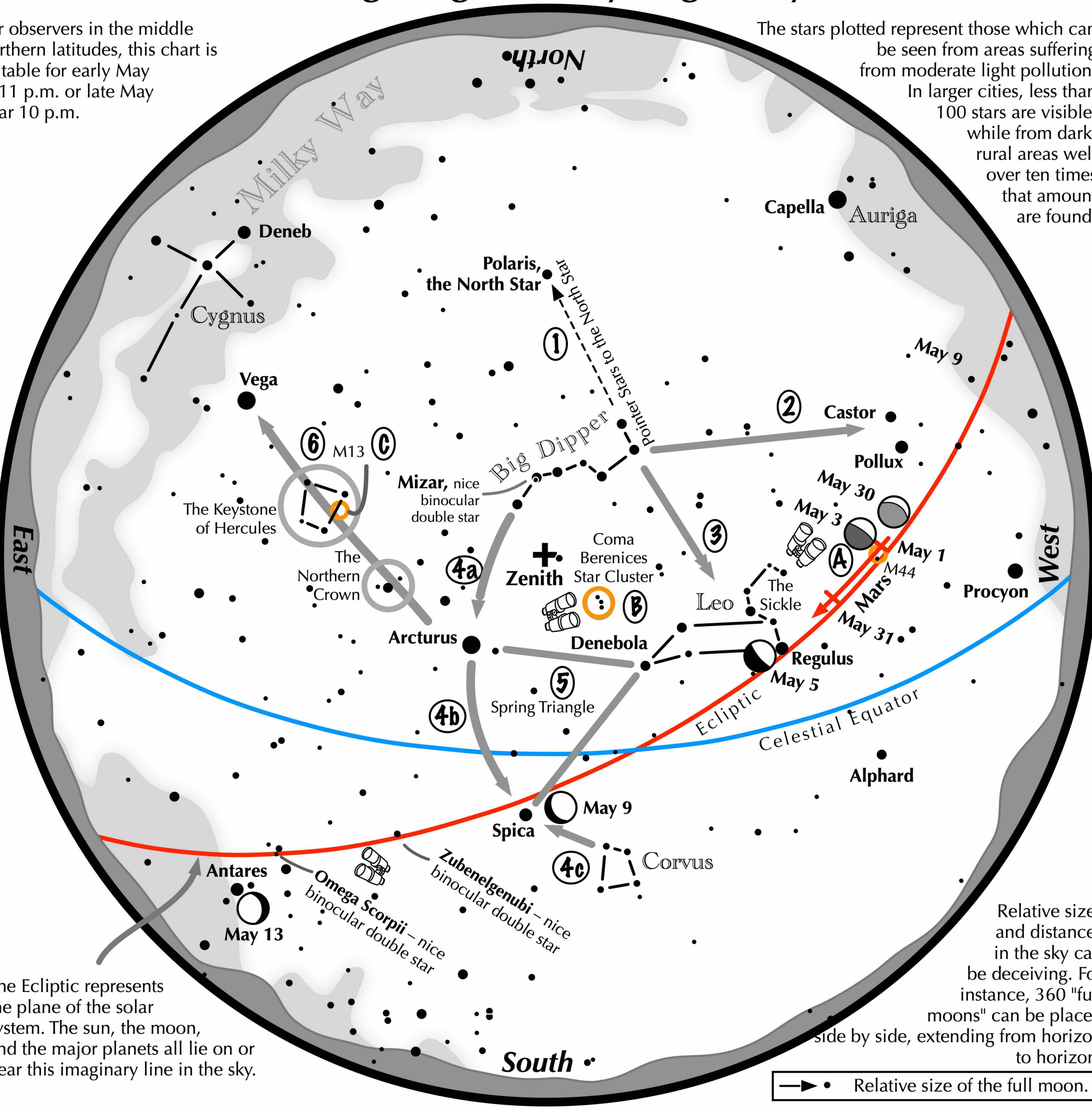
The sky in and around Canes Venatici contains an adventureland of stellar and deep sky treasures, so take advantage of the warmer evenings and do a little treasure hunting!



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.

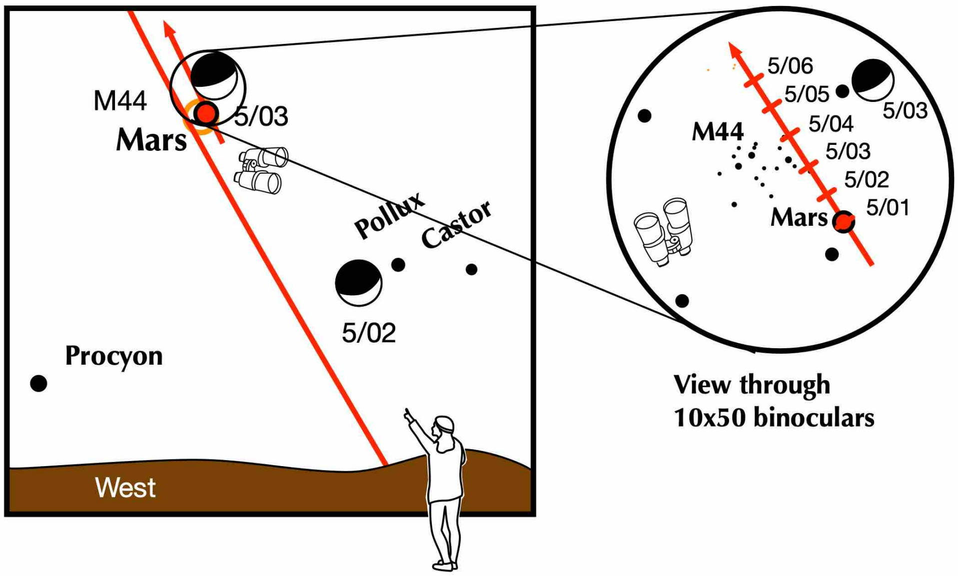
Navigating the May night sky: Simply start with what you know or with what you can easily find.

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.

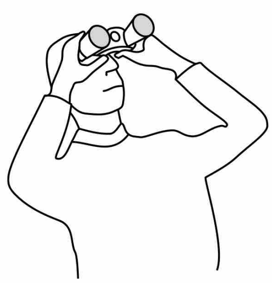
If you can see only one celestial event this month, see this one.



Beginning on May 1, look to the west-northwest 90 minutes after sunset.

• The twin stars of Gemini, Castor and Pollux, will be found forming a horizontal bar low above the horizon.

• On the following evening, the crescent moon moves near Pollux, almost forming a straight line with it and Castor.



• Red Mars slides toward M44, aka the Beehive Star cluster. Use binoculars to find Mars inching closer to the many stellar bees.

• On May 3, the thick crescent moon joins Mars sitting to the upper left of the red planet and above the bees.

• Over the next few evenings, the Red Planet moves past M44, leaving it on May 5.

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.