



The Newsletter for Keene Amateur Astronomers

Vol. 2025 No. 4

April 2025

James Webb Space Telescope, Jupiter in Infrared



Explanation: Why does Jupiter have rings? [Jupiter's main ring](#) was discovered in 1979 by NASA's passing [Voyager 1](#) spacecraft, but its origin was then a mystery. Data from NASA's [Galileo](#) spacecraft that orbited Jupiter from 1995 to 2003, however, confirmed the hypothesis that [this ring](#) was created by meteoroid impacts on small nearby moons. As a small meteoroid strikes tiny [Metis](#), for example, it will bore into the moon, vaporize, and explode dirt and dust off into a [Jovian](#) orbit. The [featured image](#) of Jupiter in [infrared light](#) by the [James Webb Space Telescope](#) shows not only [Jupiter and its clouds](#), but this ring as well. Jupiter's [Great Red Spot](#) (GRS) -- in comparatively light color on the right, Jupiter's large moon [Europa](#) -- in the center of [diffraction spikes](#) on the left, and [Europa's shadow](#) -- next to the [GRS](#) -- are also visible. Several features in the image are [not yet well understood](#), including the [seemingly separated](#) cloud layer on Jupiter's right limb.

Image Credit: [NASA](#), [ESA](#), [CSA](#), [STScI](#); *Processing & License:* [Judy Schmidt](#)

Contents

Editor's Message

Monthly Business Meeting & Upcoming KAA events

Astronomy Conventions, Retreats, and More

JWST and ALMA Are Challenging Our Understanding of Cosmic Evolution

Night Sky Network Webinar - Psyche: Exploration of a Metal World with Dr. David Williams

NASA Night Sky Notes - April's Night Sky Notes: Catch the Wave?

Observing in April

- What's Up Video
 - Navigating the Night Sky, courtesy of the Astronomical League
 - Astronomical League: Understanding the Light-Year (ly)
-

Editor's Message

Mars and Jupiter will continue to shine brightly in the night sky this month. Toward the end of the month, Jupiter will appear alongside the Crescent Moon in the evening sky, setting a few hours after sunset. Venus has moved to the morning sky, and if you wake up early on the 25th, you may catch a celestial "smile" formed by the Moon, Venus, and Saturn.

Also this month you can catch the Lyrid Meteor Shower on the 21st and 22nd. While this shower can produce as many as 100 meteors per hour, current predictions suggest around 10 - 15 meteors an hour, with the best viewing after midnight of the 21st. Meteors can appear anywhere in the sky, but you may have better luck spotting them near the blue-white star Vega in the constellation Lyra, just to its right. Lyrid meteors are known for leaving long-lasting trails, so even though the number of meteors per hour is low, seeing one of the long streaks they sometimes leave makes this meteor shower worth watching.

For stargazers with binoculars or a telescope, this month offers an opportunity to observe the globular cluster M3. Find Arcturus using the Big Dipper's handle, and look above it, halfway toward Cor Caroli (located to the right of Alkaid, the last star in the Dipper's handle). If your telescope has at least 30x magnification, you might want to take a few moments to observe the two stars in the binary system of Cor Caroli.

If deep sky objects are your preference, this is a great month to view M51, the Whirlpool Galaxy, and the Leo Triplet. The Whirlpool Galaxy is a beautiful spiral galaxy and is best viewed in the months of March, April, and May and can be found to the right of Alkaid. M65 and M66 are bright enough to be spotted with binoculars, but you'll need a telescope to view NGC 3628 (the Hamburger Galaxy). A 70x magnification will allow you to see all three galaxies in the same field of view as elongated patches.

This month's full moon on the 12th will occur at apogee, and I'm sure you will hear a lot of media coverage of how small the moon will appear.

I encourage you to try your hand at the Cosmic Coloring Compository mentioned in this month's Night Sky Networks article. If you make one, be sure to share it so it can be included in next month's newsletter.

- Susan Rolke

Monthly Business Meeting

Our next meeting will take place on April 11th at 7:00 at Phinie Faux's house.

Depending on the weather, an observing session will be held at the observatory on April 26th at 7 pm. With a Work Session either the 26th or 27th.

Other Club Events - this past March, Susan R hosted a Keene Amateur Astronomers table at Keene High School's STEM Night. The event was well attended with over 300 individuals in attendance. The table featured several hands-on activities, including a "gravity table." This interactive display helps users understand how objects move along curves in spacetime, which we perceive as gravity, in line with Einstein's Theory of General Relativity.

Astronomy Conventions, Retreats, and More

NEAF, April 5 - 6 hosted by the Rockland Astronomy Club. RCC State University in Suffern NY. For more details click [here](#).

McDonald Observatory, Live Deep Sky Tour on April 16th at 10:15 PM ET. You can join their deep sky tour [here](#).

Stellafane, July 24 - 27 hosted by the Springfield Telescope Makers. For more details click [here](#). Note - registration will open around May 1st.

JWST and ALMA Are Challenging Our Understanding of Cosmic Evolution

By Susan Rolke

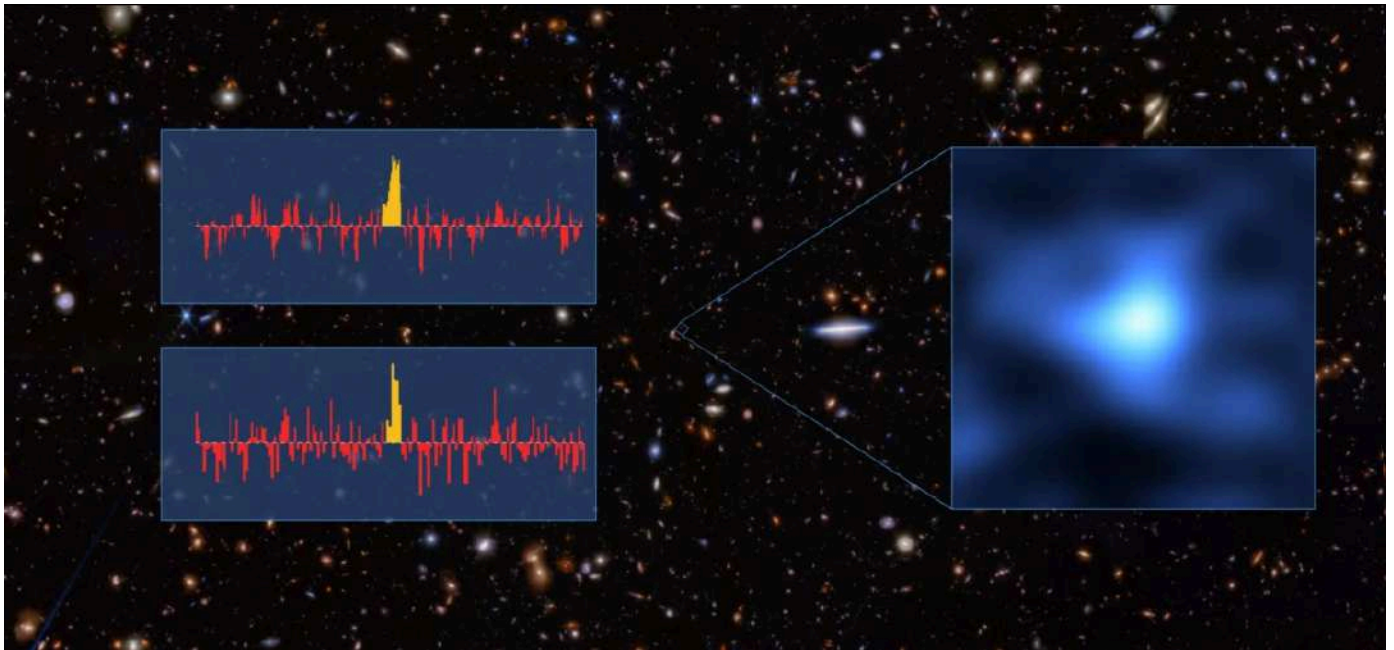
Recent discoveries by the James Webb Space Telescope (JWST) and the Atacama Large Millimeter/submillimeter Array (ALMA) in Chile are challenging current models of galactic formation and evolution. These findings stem from further investigation into an ancient galaxy known as JADES-GS-z14-0. This galaxy was initially discovered as part of the JWST Advanced Deep Extragalactic Survey (JADES), a major initiative focused on studying distant galaxies.

JWST's infrared instruments have allowed us to peer further back in time than ever before, to an era when the universe was only a few hundred million years old—just after the Big Bang. This period, known as the cosmic dawn, marks the formation of the first galaxies. New data from JWST reveals that the early universe was more active and complex than previously thought, with several galaxies forming less than 400 million years after the Big Bang.



Artist's impression of JADES-GS-z14-0, the most distant confirmed galaxy. Credit: ESO/M. Kornmesser

Discovered in 2024, JADES-GS-z14-0 is the most distant galaxy ever observed. The light from this galaxy has traveled over 13.4 billion years to reach us, making it one of the first galaxies to form in the universe. Its properties challenge existing theories: it is more massive, brighter, and chemically more complex than scientists expected and challenges our understanding of the early universe.



Credit: ALMA This image shows the location in the night sky of the galaxy JADES-GS-z14-0, an extremely tiny dot in the Fornax constellation. As of today, this is the most distant confirmed galaxy we know of. Its light took 13.4 billion years to reach us and shows the universe's conditions when it was only 300 million years old. The inset of the image shows a close-up of this primordial galaxy as seen with the Atacama Large Millimeter/submillimeter Array (ALMA).

The presence of oxygen was confirmed by two separate teams of researchers using ALMA. The luminosity of JADES-GS-z14-0 made it an excellent target for follow up studies by ALMA in the millimeter and submillimeter wavelengths. The data from these studies provided insight into the galaxy's chemical composition approximately 300 million years after the Big Bang. Spectroscopic analysis revealed an emission line corresponding to [OIII]88 μ m, which indicates the presence of doubly ionized oxygen. Even more surprising was the amount of oxygen detected was ten times greater than current theories of galactic evolution predicted.

In the early universe, hydrogen, helium, and trace amounts of lithium were the primary elements. Young stars in newly formed galaxies are mostly made of hydrogen and helium, with heavier elements forming through stellar evolution as lighter elements fuse into heavier ones. When stars explode as supernovae, they release oxygen and other heavy elements into space, which are later incorporated into new generations of stars. The amount of oxygen detected in JADES-GS-z14-0 suggests that this galaxy not only formed early but also evolved much more rapidly than expected, challenging assumptions about the rate of star formation and chemical evolution.



ALMA antennas pointing to the Milky Way on Atacama Desert. Credit: NSF/ AUI/ NSF NRAO/ B.Foott

By analyzing the redshift of the oxygen emission line detected by ALMA, researchers were able to refine the galaxy's distance with remarkable precision, narrowing the cosmological redshift to a value of $z=14.18$. The uncertainty in this measurement is just 0.005%, which is equivalent to being off by 5 centimeters over a distance of 1 kilometer.

The complementary strengths of these two observatories—JWST's deep imaging and ALMA's precise spectral measurements—allowed researchers to refine our understanding of the galaxy's chemical composition and its rapid evolution. Together, the two telescopes provided a more complete picture of the early universe,

pushing the boundaries of what we know about galactic formation and evolution in the first few hundred million years after the Big Bang.

For more information:

ALMA Press Release, [*ALMA Discovers Oxygen in Most Distant Known Galaxy*](#)

[Schouws et al. “Detection of \[OIII\]88μm in JADES-GS-z14-0 at z=14.1793”](#)

Night Sky Network Online Webinar

Join NASA [Night Sky Network](#) on Wednesday, April 16, at 9:00 PM Eastern Dr. David Williams where we’ll discuss the current status of NASA’s Psyche Mission.

In January 2017, NASA selected Arizona State University to lead its Discovery-class mission, Psyche, aimed at exploring the largest metallic asteroid in the Solar System, (16) Psyche. Believed to be the exposed Fe-Ni core of an ancient planetesimal, Psyche may provide insights into planetary formation. The spacecraft will begin orbiting the asteroid in August 2029 for a 24-month exploration mission. Join Professor David Williams, Deputy Imager Lead, as he discusses the Psyche asteroid, the mission’s objectives, and its role in the broader exploration of our Solar System.

Dr. David A. Williams is a Research Professor at Arizona State University and Director of the Ronald Greeley Center for Planetary Studies. His research focuses on volcanology, planetary geology, and remote sensing, with projects involving planetary mapping and geochemical studies across bodies like Mars, Vesta, and Ceres. He has contributed to NASA missions such as Magellan, Galileo, and Dawn, and is currently a Co-Investigator and Deputy Imager Lead on NASA’s Psyche Mission and a member of the JANUS camera team on ESA’s JUICE mission. Elected a Fellow of the Geological Society of America in 2014, asteroid 10,461 Dawilliams was named in his honor.

NASA Night Sky Notes, March 2025



This article is distributed by NASA's Night Sky Network (NSN).

The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

April's Night Sky Notes: Catch the Waves!

By Kat Troche

The Electromagnetic Spectrum

If you've ever heard the term "radio waves," used a microwave or a television remote, or had an X-ray, you have experienced a broad range of the electromagnetic spectrum! But what is the [electromagnetic spectrum](#)? According to Merriam-Webster, this spectrum is "*the entire range of wavelengths or frequencies of electromagnetic radiation extending from gamma rays to the longest radio waves and including visible light.*" But what does **that** mean? Scientists think of the entire electromagnetic spectrum as many types of light, only some that we can see with our eyes. We can detect others with our bodies, like infrared light, which we feel as heat, and ultraviolet light, which can give us sunburns. Astronomers have created [many detectors](#) that can "see" in the full spectrum of wavelengths.



This illustration shows the wavelength sensitivity of a number of current and future space- and ground-based observatories, along with their position relative to the ground and to Earth's atmosphere. The wavelength bands are arranged from shortest (gamma rays) to longest (radio waves). The vertical color bars show the relative penetration of each band of light through Earth's atmosphere. Credit: NASA, STScI

Telescope Types

While multiple types of telescopes operate across the electromagnetic spectrum, here are some of the largest, based on the wavelength they primarily work in:

- Radio:** probably the most famous radio telescope observatory would be the Very Large Array (VLA) in Socorro County, New Mexico. This set of 25-meter radio telescopes was featured in the 1997 movie *Contact*. Astronomers use these telescopes to observe protoplanetary disks and black holes. Another famous set of radio telescopes would be the Atacama Large Millimeter Array (ALMA) located in the Atacama Desert in Chile. ALMA was one of eight radio observatories that helped produce the first image of supermassive black holes at the center of M87 and Sagittarius A* at the center of our galaxy. Radio telescopes have also been used to study the microwave portion of the electromagnetic spectrum.
- Infrared:** The James Webb Space Telescope (JWST) operates in the infrared, allowing astronomers to see some of the earliest galaxies formed nearly 300 million years after the Big Bang. Infrared light allows astronomers to study galaxies and nebulae, which dense dust clouds would otherwise obscure. An excellent example is the [Pillars of Creation](#) located in the [Eagle Nebula](#). With the side-by-side image comparison below, you can see the differences between what JWST and the Hubble Space Telescope (HST) were able to capture with their respective instruments.



NASA's Hubble Telescope captured the Pillars of Creation in 1995 and revisited them in 2014 with a sharper view. Webb's infrared image reveals more stars by penetrating dust. Hubble highlights thick dust layers, while Webb shows hydrogen atoms and emerging stars. You can find this and other parts of the Eagle Nebula in the Serpens constellation. Credit: NASA, ESA, CSA, STScI, Hubble Heritage Project (STScI, AURA)

- Visible:** While it does have some near-infrared and ultraviolet capabilities, the Hubble Space Telescope (HST) has primarily operated in the visible light spectrum for the last 35 years. With over 1.6 million observations made, HST has played an integral role in how we view the universe. [Review Hubble's Highlights here.](#)



The Crab Nebula, located in the Taurus constellation, is the result of a bright supernova explosion in the year 1054, 6,500 light-years from Earth. Credit: X-ray: NASA/CXC/SAO; Optical: NASA/STScI; Infrared: NASA/JPL/Caltech; Radio: NSF/NRAO/VLA; Ultraviolet: ESA/XMM-Newton

- **X-ray:** Chandra X-ray Observatory was designed to detect emissions from the hottest parts of our universe, like exploding stars. X-rays help us better understand the composition of deep space objects, highlighting areas unseen by visible light and infrared telescopes. This image of the [Crab Nebula](#) combines data from five different telescopes: The VLA (radio) in red; Spitzer Space Telescope (infrared) in yellow; Hubble Space Telescope (visible) in green; XMM-Newton (ultraviolet) in blue; and Chandra X-ray Observatory (X-ray) in purple. You can view the breakdown of this multiwavelength image [here](#).

Try This At Home

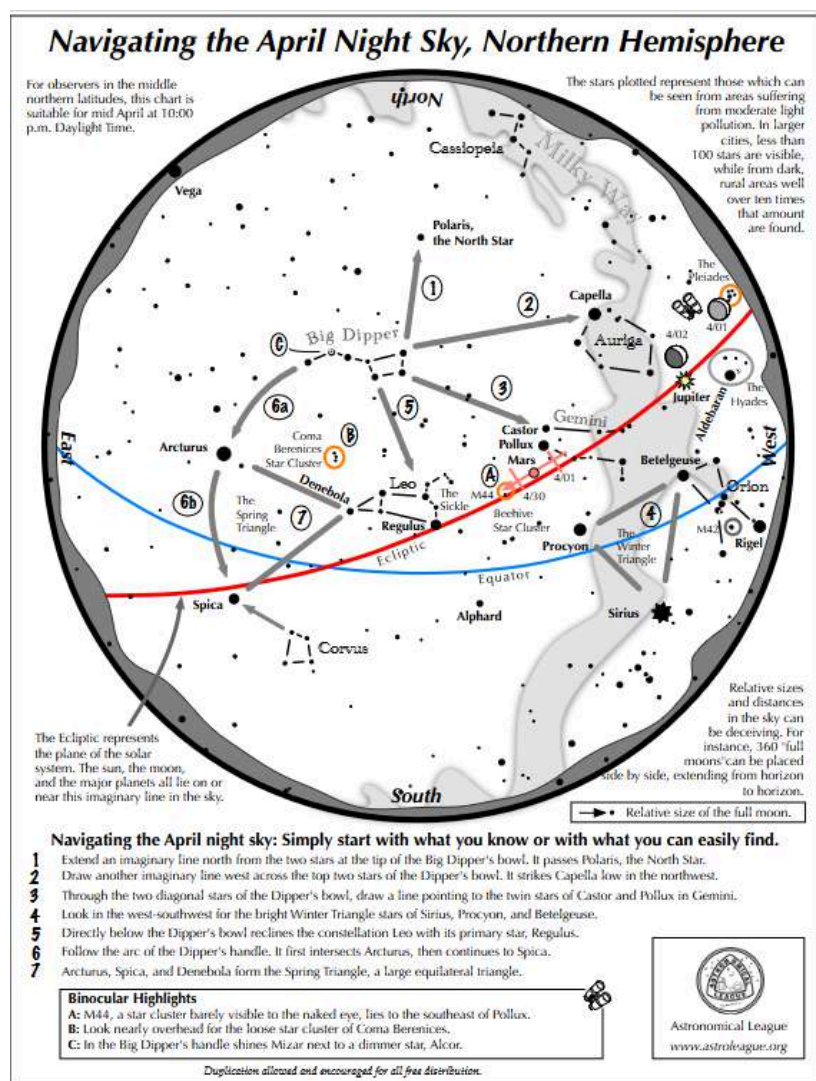
Even though we can't see these other wavelengths with our eyes, learn how to create multiwavelength images with the [Cosmic Coloring Compositor](#) activity and explore how astronomers use representational color to show light that our eyes cannot see with our [Clues to the Cosmos](#) activity.

Observing

To find out skywatching tips for this month, click on the following links (in blue and underlined) to learn more.

Video: [What's Up April 2025 Sky Watching Tips from NASA](#)

Click link for a larger image [April 2025](#)



You may find past issues of the Astronomical League charts [here](#).

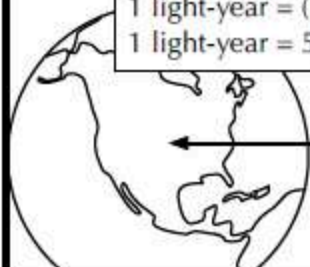


A light-year is a unit expressing distance, not time.

Understanding the Light-Year (ly)

One light-year equals the distance that light travels through a vacuum in one year:
about 5.9 trillion miles (or about 9.5 trillion km)

1 light-year = distance that light travels through a vacuum in 1 year
1 light-year = (velocity of light) x 1 year
1 light-year = (186,000 miles/sec x 3600 sec/hr x 24 hrs/day x 365.25 days/year) x 1 year
1 light-year = 5,870,000,000,000 miles = about 5.9 trillion miles



Distance to the Moon = 1.25 light-seconds



... another 498 light-seconds (or 8.3 minutes) to the Sun

Distance from the Sun (light-minutes)



Distance to the Stars - and beyond (light-years) ...

