Keene Amateur Astronomers

The Newsletter for Keene Amateur Astronomers

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The Trifid Nebula and Lagoon Nebula

This image combines 678 separate images taken by NSF–DOE Vera C. Rubin Observatory in just over seven hours of observing time. Combining many images in this way clearly reveals otherwise faint or invisible details, such as the clouds of gas and dust that comprise the Trifid nebula (top) and the Lagoon nebula, which are several thousand light-years away from Earth. Credit: NSF–DOE Vera C. Rubin Observatory

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Editor's Message

Since this summer we have been hearing a lot of information about 3I ATLAS. Some of it scientific, and some of it not. I was recently asked about a video that appeared to be from Brian Cox on 3I ATLAS. I also received a notification from Michio Kaku that an AI version was impersonating him. There are also certain individuals in the research community whose ideas are not given credence but have received a lot of air time and attention from the media because, let's face it, aliens or the idea of them is intriguing and it sells.

I admit, I found it very challenging to sift through the latest information available on 3I ATLAS. I hope you enjoy the article on it and find it helpful to sort science from speculation/sensationalism. I also found it interesting that some of the information that is presented in the media as fact has not yet been confirmed by other teams of researchers such as the observation of it appearing more blue. Reading the information as it is made available is very intriguing and in time scientists will have a better understanding.

But you don't have to wait to read about the latest findings from research observatories. You have the ability to view 3I ATLAS yourself if you own a telescope. Information is at the end of the article on where to find it. Happy viewing.

Great objects to view this month:

- **NGC 869/884 - The Double Cluster** is the feature of one of our Astronomical League charts this month. It is located between Cassiopeia and Perseus. It can be viewed with the naked eye. A magnification of 70x or less will be needed to view them together.
- **Messier 33 - The Triangulum Galaxy** located in Triangulum. You will need dark skies and a high magnification to see its spiral arms. It will appear like a faint smudge with binoculars. It is a favorite target for astrophotography.
- **Saturn's rings** appear almost edge on this month. Approximately every 15 years the planet's rings almost disappear as we cross Saturn's orbital plane.

- Susan Rolke

Monthly Business Meeting

Our next meeting will take place on November 14th at 7 pm at Keene State College. An observing session will be held on the 15th at the Sullivan Observatory weather permitting.

Club Happenings

On November 12th at 7 pm Susan Rolke will be giving a talk at the Fitzwilliam Town Library about her adventure in Chile. On the 13th, she will be presenting at the Chesterfield Public Library at 6:30. Members of the public are welcome at both events.

An observing event will take place weather permitting, on Friday December 12th from 7pm to 8:30pm at the Otter Brook Dam for Cheshire County 4H club members.

3I ATLAS, Interstellar Comet

By Susan Rolke

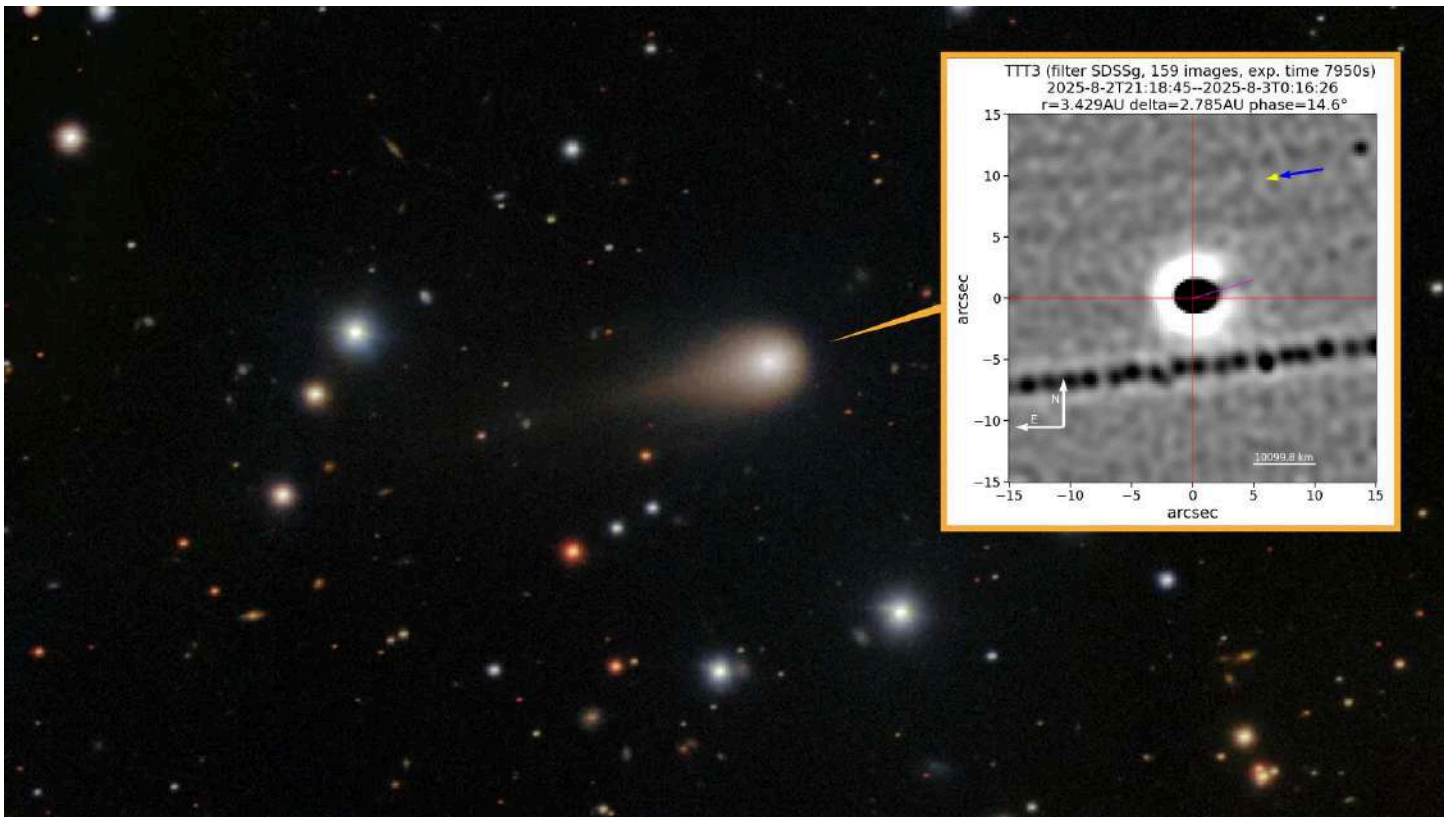
We are living in one of the most exciting times in astronomy. Only recently have we begun to observe interstellar objects that formed beyond our solar system. These rare cosmic travelers let us study material from another star system without leaving our own. They act as time capsules, preserving evidence of how planets and stars formed in other regions of the Milky Way, by studying their reflected light and the gases they release. Each new visitor tells its own story, shaped by its own unique past. Each one provides a glimpse into conditions beyond the boundaries of our own solar system.

The most recent interstellar object to our solar system is 3I ATLAS. “3I” because it’s the third interstellar object ever discovered, and “ATLAS” for the survey telescope that found it, the *Asteroid Terrestrial-impact Last Alert System*. So far, only two others are known. The first, 1I/‘Oumuamua, discovered in 2017, became famous for its unusual, elongated shape. The second, 2I/Borisov, found in 2019, was the first confirmed interstellar comet, complete with a tail of gas and dust. Each of these rare visitors has its own unique characteristics, offering valuable clues about the diverse environments in which they may have formed or traveled.

I would like to pause here for a moment and stress the word known. These objects have been passing through our solar system without our knowledge. It is only now that we have the ability to detect and study them as they travel on their way through our galactic neighborhood.

It is estimated that the Rubin Observatory will detect a dozen interstellar objects annually. In fact, 37 images of 3I ATLAS were recorded by Rubin Observatory in its first set of images. However, it was not ‘discovered’ until July 1st when it was announced by the ATLAS survey team. In fact it was discovered that the Transiting Exoplanet Survey Satellite (TESS) had captured images of 3I ATLAS even earlier in May and June.

Like its predecessors, 3I ATLAS is literally just passing through. Its hyperbolic orbit means it will not loop back around the Sun. It is on a one-way journey through our solar system before heading back into interstellar space. Its speed and trajectory confirm it originally formed around another star. Interestingly, it is passing within 5 degrees of the ecliptic, the flat plane where the planets orbit. This makes it easier for our various spacecraft spread throughout our solar system to potentially collect additional data as it moves along in nearly the same plane as the planets. However, it should be noted that none of these spacecraft were designed for this type of observation.



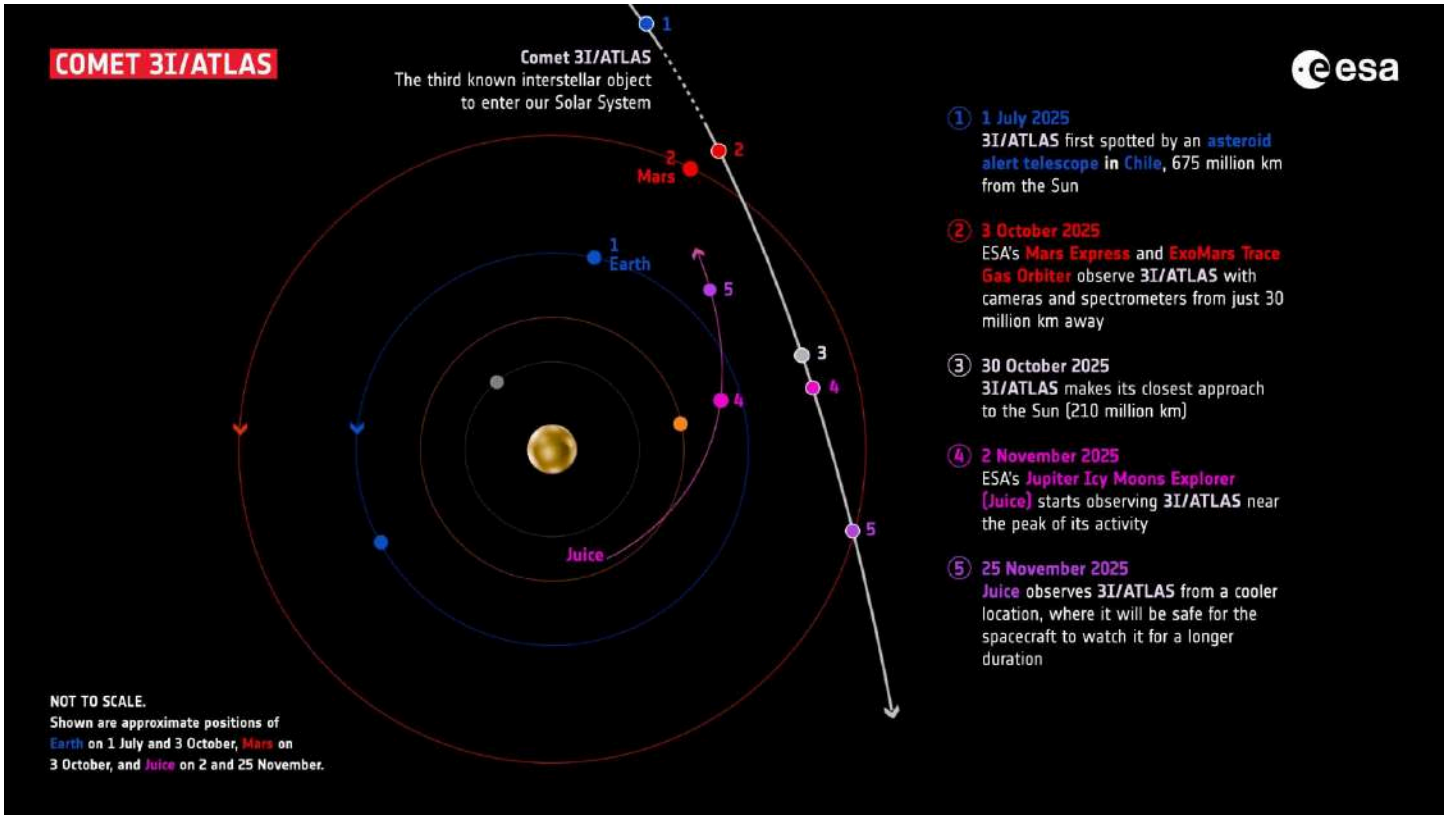
A recent Gemini Observatory image of comet 3I/ATLAS (background) overlaid with the new Two-meter Twin Telescope image of the comet's jet (inset). (Image credit: Comet photograph: International Gemini Observatory/NOIRLab/NSF/AURA/Shadow the ScientistImage Processing: J. Miller & M. Rodriguez (International Gemini Observatory/NSF NOIRLab), T.A. Rector (University of Alaska Anchorage/NSF NOIRLab), M. Zamani (NSF NOIRLab); Inset: Teide Observatory, M. Serra-Ricart, Light Bridges)

Each of the interstellar objects we have observed to date have been unique. We have seen a large variation in each object that has provided us with tantalizing information of worlds beyond our solar system. 3I ATLAS is the biggest object to date, 5.5 - 10 km (3.5 - 6.2 miles) across as compared to Oumuamua which was estimated to be less than half a mile long. It is also fast, traveling at 130,000 miles per hour when it was discovered, making it our fastest visitor. Observations of 3I ATLAS continue to challenge our understanding of comets. As it made its way past our Sun, its speed increased more than had been predicted due to gravity. Sources of non-gravitational accelerations can be caused by jets of gas and dust escaping from the surface that act like tiny thrusters. The small force of this material lost from the surface can cause small changes in the

comet's direction and speed. Determining the trajectory of comets is notoriously difficult due to the unpredictable jettison of material.

3I ATLAS is providing us with a wealth of new information and continues to exhibit unique characteristics. It became active much further out from our Sun than most comets. At 6 AUs, 6 times the average distance of the Earth from the Sun, it was already exhibiting comet-like behavior. Observations in July found that the comet's mass loss increased from 0.3 to 4.2 kg/. Using spectroscopic analysis of its coma, the glowing cloud around its nucleus, findings revealed it was dominated by carbon dioxide (CO_2) gas with traces of hydroxyl gas (OH), an ultra violet byproduct of water (H_2O).

In comparison, comets native to our solar system tend to become active around 3 AUs. The possible reason for early activity is due to its unusual composition. Carbon dioxide is more volatile and sublimates rapidly. This change from a solid to gas results in absorbing heat from the surface and lowering the surrounding temperature. This cooling might be the cause of the minimal amount of water detected in early observations or it could be due to the chemical composition of the object. The heating of the comet around the Sun might help to answer this question.



Infographic showing the path of comet 3I/ATLAS, the third known interstellar object to enter our solar system. It displays the orbits of Earth, Mars and the JUICE spacecraft around the sun, along with key dates and events as comet 3I/ATLAS travels through the inner solar system in 2025. (Image credit: ESA)

As it approached the Sun, 3I ATLAS brightened more than expected and as anticipated it emerged even brighter. On its approach, it shifted from a reddish hue to green and one team of researchers have reported that it

is more blueish than the Sun. These findings have not yet been confirmed by other scientists. The team of researchers have proposed that the blue color is likely due to the presence of certain gases, specifically ammonia and carbon monoxide. The reddish hue initially observed has been attributed to the abundance of gas coming off of the surface. The brief green color observed may have been caused by dicarbon or cyanide present in the coma.

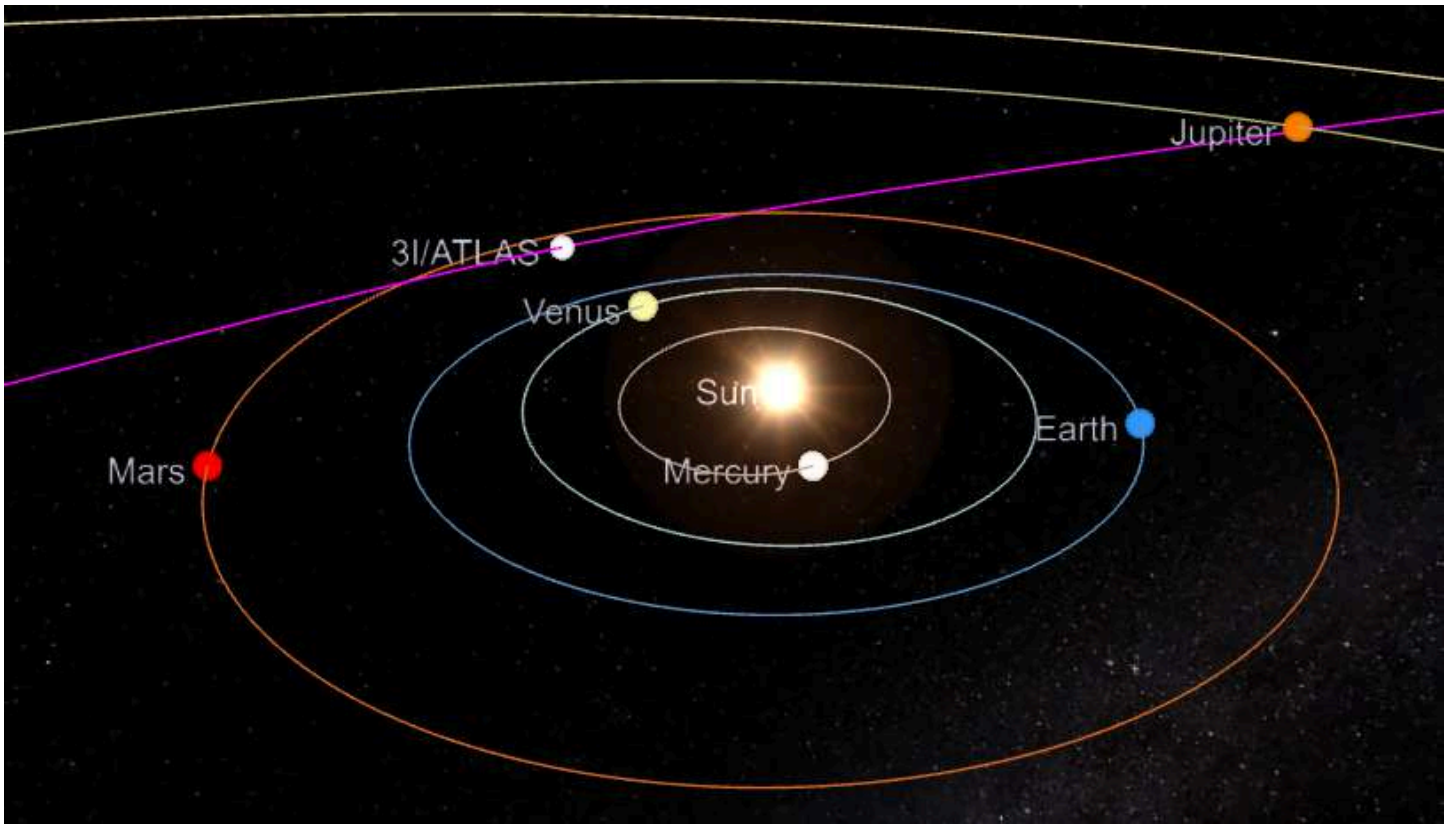
Our understanding of our observations of these interstellar interlopers is constantly evolving. 3I ATLAS's abundance of carbon dioxide might not be representative of the solar system and the conditions in which it formed billions of years ago. A group of researchers have proposed that the carbon dioxide is due to cosmic radiation. The authors of this new study propose cosmic rays have significantly altered the physical state of the comet's ice creating an irradiated crust. Galactic cosmic rays are made up of high energy particles that can change carbon monoxide (CO) into carbon dioxide (CO_2). This change occurs very slowly but has been happening over billions of years. One study indicates the object is 3 billion years older than our 4.5 billion year old solar system.

An image that may depict interstellar comet 3I/ATLAS in the skies of Mars, as seen by NASA's Perseverance rover. (Image credit: NASA/JPL-Caltech) Note, due to the government shutdown, this image has not been verified by NASA that it is 3I ATLAS.

3I ATLAS made its closest approach to our Sun on October 29th passing at 1.4 AUs. It is now beginning to reemerge from the Sun's glare as it journeys around the opposite side of the Sun. It has already been observed by Lowell Discovery Telescope just prior to dawn. As the angle of separation between the Sun and 3I ATLAS continues to increase, other research telescopes should be able to observe it in the early pre-dawn hours. Currently it is too low on the horizon for most research telescopes to make observations. However, it is

viewable in a small telescope in the hours before dawn. This is an excellent time for amateur astronomers to contribute to science and our understanding of this object. Unistellar's global network of 25,000 citizen astronomers working with SETI, will be collecting data to help researchers study the composition and trajectory of 3I ATLAS.

If you are hoping to catch a glimpse of this passing visitor to our solar system, the following website will provide you with up to date information on its location. https://theskylive.com/c2025n1-info



Credit: Theskylive.com 3D Solar System Viewer.

There have been articles and social media claiming 3I ATLAS is an alien spacecraft. Carl Sagan once said, "Extraordinary claims require extraordinary evidence." Indeed, the inspiration for writing this article was due to the large amount of misleading information on the web, the use of AI to impersonate leading scientists, and individuals claiming observations can not be explained by natural phenomenon appearing on respectable news channels and websites. Similar claims were also made about Oumuamua.

Here is what we know so far. It behaves like a comet, creating a natural coma and tail. No signs of technology or alien signals have been detected. Different origins and interstellar exposure account for its unique chemistry. Natural processes and outgassing can account for changes in color and trajectory. In short, there is no reason to suspect it is anything other than a comet passing through our solar system.

Over the next few months, there will continue to be more information on this visitor to our solar system as it returns to our night sky. Researchers will be reviewing the works of others, challenging findings, and building models that best fit the observations. Currently the ESA has plans to capture images of 3I ATLAS as it

makes an approach near Jupiter. Unfortunately due to the government shutdown, 80% of NASA's workforce have been sent home. This includes the researchers and analysts. We will need to hope that someone is collecting data that can be analyzed in the future for this once in a lifetime opportunity to study this object.

As 3I/ATLAS continues along its orbit and returns to interstellar space, it will soon disappear from view. The data collected during its passage by, both amateur astronomers and professional observatories, will contribute valuable insights for future missions such as ESA's *Comet Interceptor*, intended to intercept and study future interstellar objects.

Additional Resources

- SETI Live, Comet 3I ATLAS at Perihelion with planetary astronomers Franck Marchis and Ariel Graykowski for a special SETI Live all about Comet 3I/ATLAS
- Virtual Telescope Project will be streaming live images of 3I ATLAS starting November 11th

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Night Sky Network Online Webinar

Join the NASA Night Sky Network is set to return in December and spotlight the Astronomy Picture of the Day.

Observing

To find out skywatching tips for this month, click on the following link to learn more.

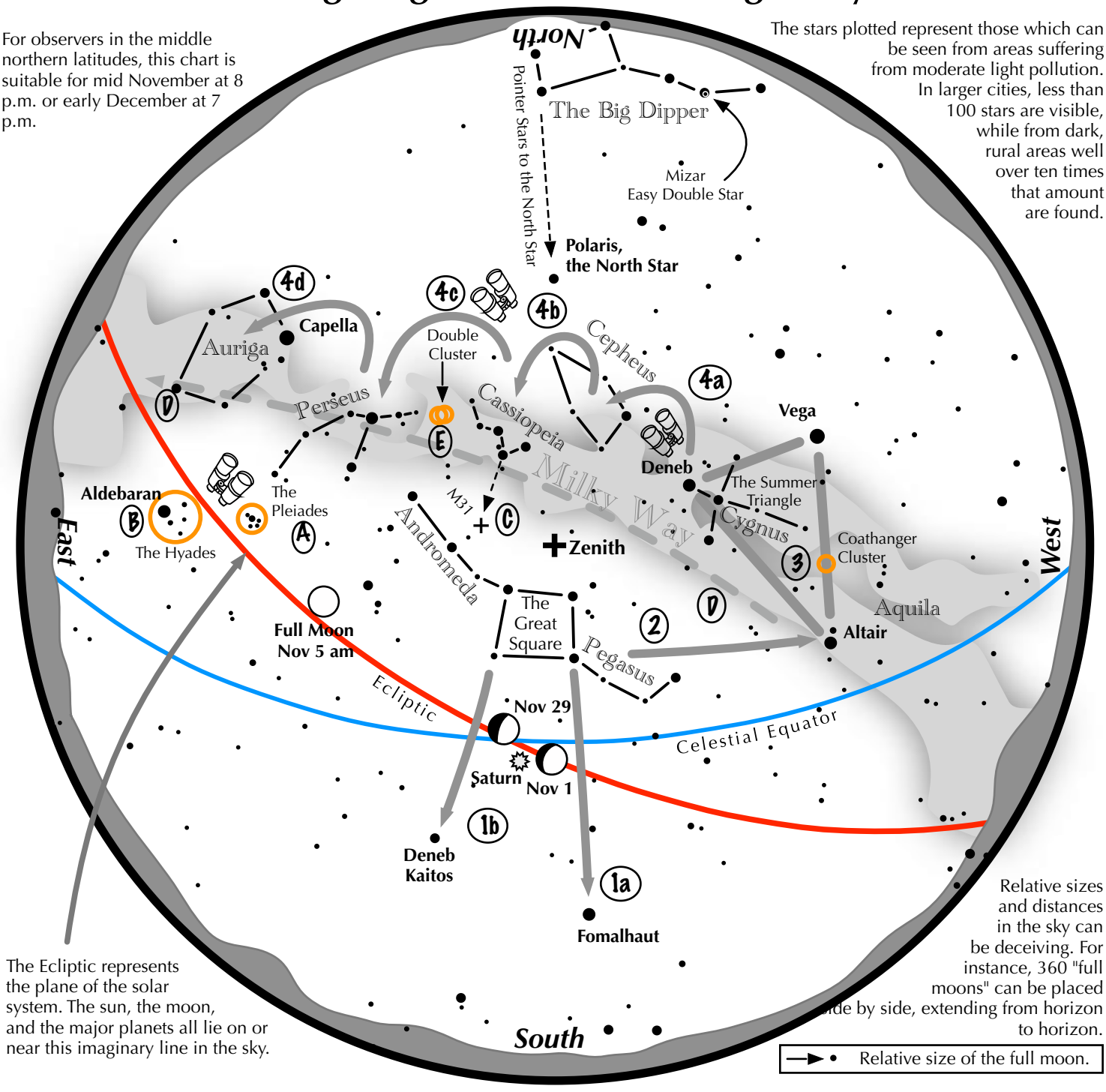
Video from NASA is not available due to the government shutdown. In its place you might find this video informative. Sky & Telescope's Sky Tour Podcast for November 2025.

You can find past pdfs of the Astronomical League charts **here.** Turn to the end of the Newsletter to see what is up this month.

Navigating the November Night Sky

For observers in the middle northern latitudes, this chart is suitable for mid November at 8 p.m. or early December at 7 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 November night sky: Simply start with what you know or with what you can easily find.

1. Face south. Almost overhead lies the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend a line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the south. A line extending southward from the two easternmost stars, passes Deneb Kaitos, the second brighest star in the south.
2. Draw a line westward following the southern edge of the Square until it strikes Altair, part of the "Summer Triangle."
3. Locate Vega and Deneb, the other two stars of the Summer Triangle. Vega is its brightest member, while Deneb sits in the middle of the Milky Way.
4. Jump along the Milky Way from Deneb to Cepheus, which resembles the outline of a house. Continue jumping to the "W" of Cassiopeia, then to Perseus, and finally to Auriga with its bright star Capella.

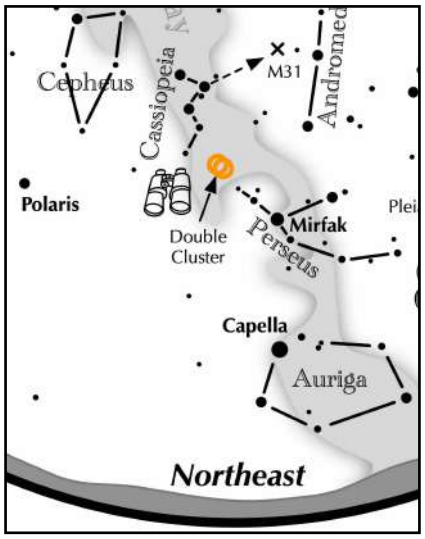
Binocular Highlights

A and B: Examine the stars of the Pleiades and Hyades, two naked eye star clusters. **C:** The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval. **D:** Sweep along the Milky Way from Altair, past Deneb, through Cepheus, Cassiopeia and Perseus, then to Auriga for many intriguing star clusters and nebulous areas. **E.** The Double Cluster.

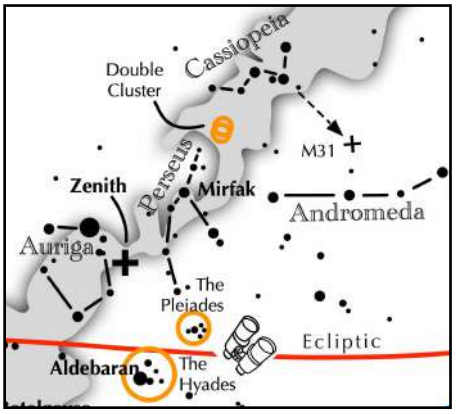
Can you easily find this open cluster showpiece?

Every Curious Skywatcher should know how to find the Double Cluster

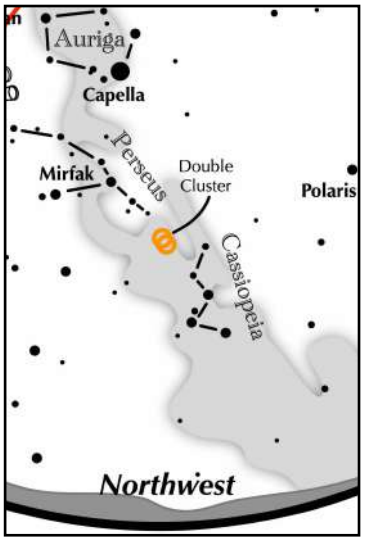
Visible in the early evening sky from late October through late March.



November in the northeast



January facing south looking past the zenith



March in the northwest

The **Double Cluster** can be spotted with unaided eye from a <u>dark</u> sky as a dim glow in the Milky Way between Perseus and Cassiopeia. Through 10x50 binoculars, it is an obvious sight, revealing its brighter glittering lights. The neighboring cluster, **Stock 2,** can be seen as a much dimmer and more spread out grainy glow.

How to find the Double Cluster (aka NGC 869 & 884, and Caldwell 14):

1. Find the "w" shaped constellation Cassiopeia and the neighboring constellation to its southeast, Perseus. Identify Perseus' brightest star, 1.8 magnitude Mirfak.
2. Mid way between the center star of Cassopeia's "w" (Gamma Cas) and Mirfak lies a soft glow.
3. Binoculars aimed at the glow reveal the famous Double Cluster, also called NGC 869 and 884, Caldwell 14, and h Persei and Chi Persei.
4. Place the Double Cluster near the southern edge of the field. Near its center lies Stock 2, the Muscleman Cluster, which appears as a large, dim grainy glow.