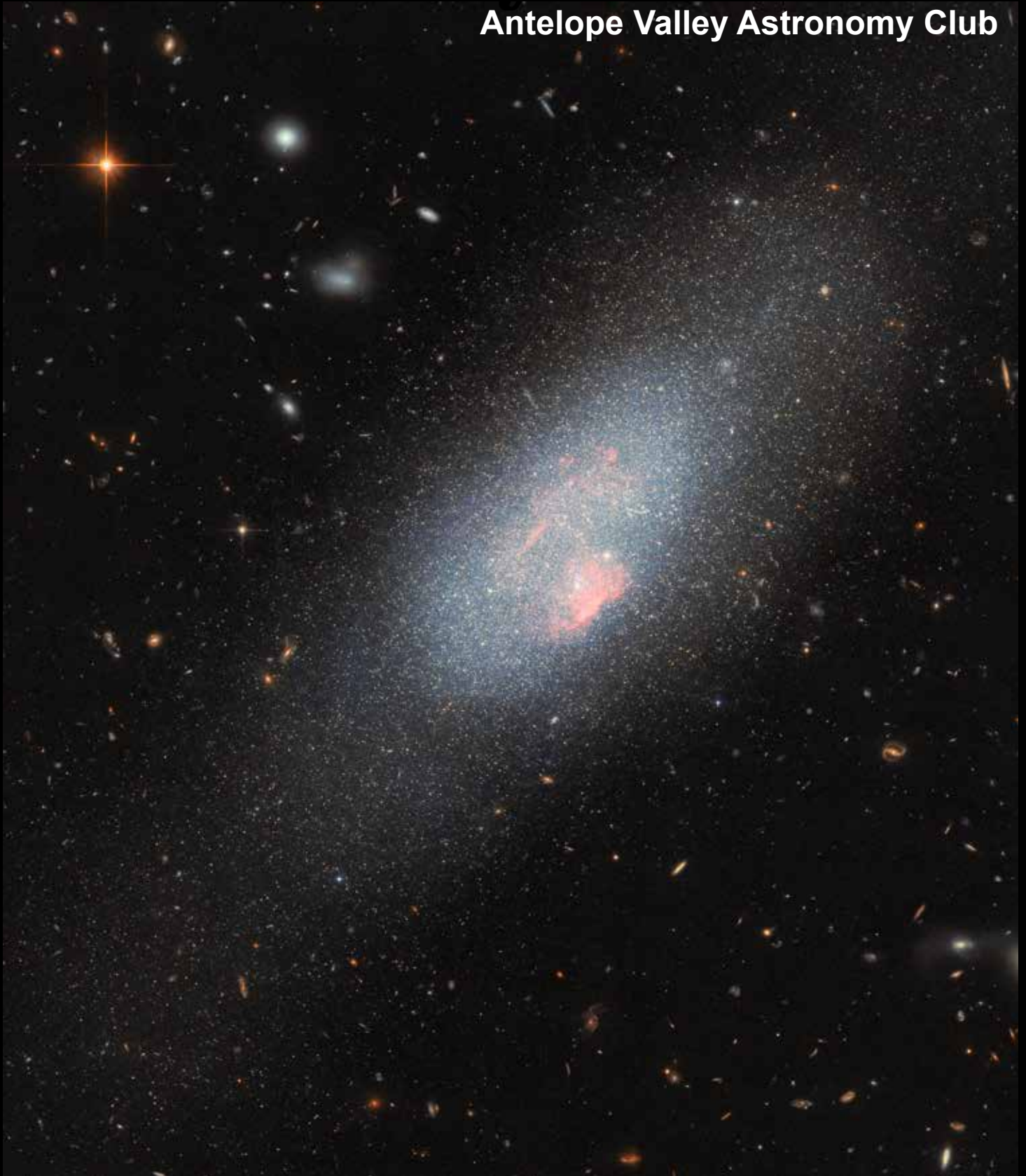


Volume 46.1

January 2026

# Desert Sky Observer

Antelope Valley Astronomy Club



# Desert Sky Observer

www.avastronomyclub.org

January 2026

## Upcoming Events

January 9: Club Meeting

January 24: Moonwalk @ PDW 6:00 PM

Every clear night: Personal Star Party

February 7: Moonwalk @ PDW 6:30 PM

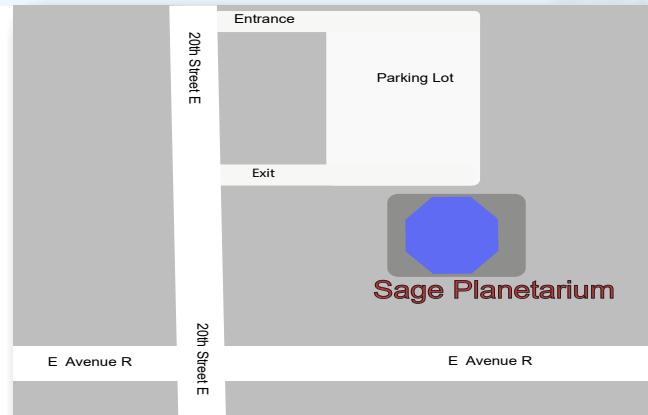
February 13: Club Meeting

March 13: Club Meeting/Painting Class

March 21: Messier Marathon @ Red Rock Canyon SP



AVAC Calendar



## Board Members

**President:** Phil Wriedt (661) 917-4874  
[president@avastronomyclub.org](mailto:president@avastronomyclub.org)

**Vice-President:** Vacant  
[vice-president@avastronomyclub.org](mailto:vice-president@avastronomyclub.org)

**Secretary:** Rose Moore (661) 972-1953  
[secretary@avastronomyclub.org](mailto:secretary@avastronomyclub.org)

**Treasurer:** Rod Girard (661) 803-7838  
[treasurer@avastronomyclub.org](mailto:treasurer@avastronomyclub.org)

**Director of Community Development:**  
Christian Amaya (661) 972-0091  
[community@avastronomyclub.org](mailto:community@avastronomyclub.org)

## Appointed Positions

**Newsletter Editor:** Phil Wriedt (661) 917-4874  
[dso@avastronomyclub.org](mailto:dso@avastronomyclub.org)

**Lunar Club:**  
Matt Leone (661) 713-1894

**Equipment & Library:** vacant  
[library@avastronomyclub.org](mailto:library@avastronomyclub.org)

**Club Historian:** vacant  
[history@avastronomyclub.org](mailto:history@avastronomyclub.org)

**Webmaster:** Steve Trotta (661) 269-5428  
[webmaster@avastronomyclub.org](mailto:webmaster@avastronomyclub.org)

**Night Sky Coordinator:**  
Rose Moore (661) 972-1953

**Astronomical League Coordinator:**  
Phil Wriedt (661) 917-4874  
[al@avastronomyclub.org](mailto:al@avastronomyclub.org)



## Monthly Meetings

Monthly meetings are held at the **S.A.G.E. Planetarium** in Palmdale, the second Friday of each month except December. The meeting location is at the northeast corner of Avenue R and 20<sup>th</sup> Street East. Meetings start at 7 p.m. and are open to the public. *Please note that food and drink are not allowed in the planetarium.*

## Membership

Membership in the Antelope Valley Astronomy Club is open to any individual or family.

The Club has three categories of membership.

- Family membership at \$30.00 per year.
- Individual membership at \$25.00 per year.
- Junior membership at \$15.00 per year.

Membership entitles you to ...

- The Desert Sky Observer -- monthly newsletter
- The AVAC Membership Manual.
- To borrow club equipment, books, videos, and other items.

**AVAC**

**PO Box 8545**

**Lancaster, CA 93539-8545**

Visit the Antelope Valley Astronomy Club website at [www.avastronomyclub.org/](http://www.avastronomyclub.org/)

[www.instagram.com/av\\_astronomyclub](https://www.instagram.com/av_astronomyclub)

The Antelope Valley Astronomy Club, Inc. is a 26 USC §503(c)(3) California Non-Profit Corporation.



[www.avastronomyclub.org](http://www.avastronomyclub.org)

## President's Message

By Phil Wriedt

I hope everyone's Christmas was Merry and the New Year was Happy,

On the 6th of December we had our Christmas Party at Gino's in the Lancaster Marketplace, like we have for the past 8 years or so. Woodland Hills Camera (one of our sponsors), came through with a ZWO Seestar S50 telescope for the Grand Prize which was finally won by a new member, Janet, who didn't already have a telescope!

Our next Moonwalk is on Saturday the 24th of January. Sunset will be at 5:14 pm (Daylight Saving time ends on March 7th) and astronomical dusk is at 6:41 pm. Saturn will set at 9:26 pm, and the 39% waning Moon will set at 11:33 pm; Jupiter will transit at 10:53 pm. Get there early so you can set up in daylight. If you get a telescope by then, bring it, or if not, just come join the party at Prime Desert Woodland; the more members there, the better it will be. Don't forget warm clothes, jackets, gloves, etc., it will be January, so be a Scout and Be Prepared. There is a better than fair chance that a cold rain front could come through. Hopefully it will be a cloudless (and smokeless) night.

Our next, Dark Sky Star Party, next year will be on the 21st of March at Red Rock State Park. This will be the best opportunity to do a Messier Marathon. We are planning to get campsites 1 & 2 because they aren't right up against the cliffs, this will ensure the greatest view of the sky. After that, the next DSSP will be on April 18th, probably at Red Cliffs or Red Rock Canyon and this is the alternate date for a Messier Marathon. Watch for the emails or for the text message to know what's happening.

There is a possibility of a star party at a school on the March 19th. Watch for the email notice if it materializes.

Please come to the meetings, come to the events, join the crowd! The more the merrier!

Keep Looking Up,

Phil

## On The Cover

Note: North is 8.2° left of vertical RA: 11h 33' 30.07" DEC: 49° 14' 13.76" ( Ursa Major ) 13 mLy

This glittering blue galaxy and subject of today's ESA/Hubble Picture of the Week is a blue compact dwarf galaxy called [Markarian 178 \(Mrk 178\)](#). This galaxy, which is substantially smaller than our own Milky Way, lies 13 million light-years away in the constellation Ursa Major (The Great Bear).

Mrk 178 is one of more than 1500 Markarian galaxies. These galaxies get their name from the Armenian astrophysicist Benjamin Markarian, who compiled a list of galaxies that were surprisingly bright in ultraviolet light.

While the bulk of the galaxy is blue owing to an abundance of young, hot stars with little dust shrouding them, Mrk 178 gets a red hue from a collection of massive stars, which are especially concentrated in the brightest, reddish region near the galaxy's edge. This azure cloud is home to a large number of rare objects called Wolf-Rayet stars. Wolf-Rayet stars are massive stars that are casting off their atmospheres through powerful winds. Because Mrk 178 contains so many Wolf-Rayet stars, the bright emission lines from these stars' hot stellar winds are etched upon the galaxy's spectrum. Particularly ionised hydrogen and oxygen appear as a red colour to Mrk 178 in this photo, observed using some of Hubble's specialised light filters.

Massive stars enter the Wolf-Rayet phase just before they collapse into black holes or neutron stars. Because Wolf-Rayet stars last for only a few million years, researchers know that something must have triggered a recent burst of star formation in Mrk 178. At first glance, it's not clear what could be the cause — Mrk 178 doesn't seem to have any close galactic neighbours that could have stirred up its gas to form new stars. Astronomers believe that it was triggered by the interaction with a smaller satellite, as revealed by the presence of low surface brightness tidal features detected around Mrk178 in deep imaging acquired with the Large Binocular Telescope. Future high resolution Hubble data will be crucial to study the detailed star formation history of Mrk 178.

[Image Description: A pale blue dwarf galaxy seen on the black backdrop of space with some faraway galaxies. The galaxy itself resembles a fuzzy cloud of tightly-packed stars, with a broad halo of stars dispersed around it. Several small, glowing patches of gas are spread across the galaxy's core, where very hot stars are concentrated.] Credit: ESA/Hubble & NASA, F. Annibali, S. Hong

## From the Secretary

By Rose Moore

Members:

I hope all of you had a Merry Christmas and Happy New Year!

A reminder that the AVAC club dues for 2026 are due by the end of January. You may pay them via the AVAC website as I instructed in the email previously, or pay our treasurer Rod at our meeting on Jan. 9th.

Our first meeting of 2026 is our club meeting on Friday January 9th, at 7pm; we do not have a speaker as of yet. We are also working on getting a speaker for February from NASA. We will be handing out Night Sky Network pins and certificates, when they are available, probably in February.

We have a Prime Desert Moon Walk on Saturday January 24th, starting at 6pm; weather permitting. We'll need members with telescopes to help out at this event; further info will be in an email.

Coming up in the next few months will be PDW Moon Walks, Sue's Paint Class, our Messier Marathon in March, and more! If any suggestions, please contact a Board member, and/or bring it up for discussion in one of our meetings!

Stay warm, Rose

### In Memoriam:

Some of you may already know that member Duane Lewis, age 77, passed away after a brief illness the beginning of December. Duane had cerebral palsy, and was deaf, worsening as he aged. He was a member of the club for 20 years.

In the beginning, Duane hitched a ride with another member of the club. After a few months, Frank and I thought it would be easier if we could pick him up on our way from Tehachapi. He became our buddy to the meetings, and astronomy events. We would pick him and his telescope up and take him to local events, as well as club trips to SOFIA and Mt. Wilson. Duane made trips with us in the RV to Saddleback, the Poppy Reserve, Chuchupate and Mt. Pinos, as well as our yearly trek to RTMC at Big Bear. As his CP worsened over the last several years, he was unable to travel to overnight events, and eventually meetings.

Duane sometimes needed assistance with his telescope and viewing, and he was smart when it came to knowledge of astronomy, this was apparent in our conversations and frequent emails. We are very much going to miss him, but are glad that we and the club were able to provide him with a wonderful hobby, companionship of fellow 'astro-nuts', and astronomy related trips.

Rose



*Duane and Frank Moore,  
Mt Pinos, July 5, 2008*



*Duane, Christmas Party,  
December 7, 2019*

## AVAC Membership Renewal

It is that time of year again, time to renew your AVAC Membership; and HOORAY!!! We get to meet in a cleaned and refurbished Sage Planetarium for our monthly meetings. We are one of the few clubs that don't meet in a bookstore or the backroom of a pizza joint. The Sage Planetarium is one of the Club's most rewarding benefits.

It is very gratifying to see the early membership renewals. In these times of financial uncertainty our members are more than ever the lifeblood for the AVAC. That said, please worry not, financially the club is still solvent and we are able to meet all our obligations while providing for future club events and guest speakers etc.

Please remember that our meetings are open to the public and all will be welcome. So, if for any reason you are unable to renew your membership you are still welcome to attend and we look forward to seeing you all again.

For administrative reasons we encourage members to renew their membership in January. For myself the easiest way to renew my membership was through the AVAC website via our PayPal account. However you can renew at our monthly club meetings with good old cash or by check.

For those unable to attend our monthly meeting you can renew your membership through the mail by sending a check to the club's Post Office Box:

Antelope Valley Astronomy Club  
PO BOX 8545  
Lancaster, CA 93539-8545

For members less familiar with the club's website, it is actually fairly simple:

- Google Antelope Valley Astronomy Club and then open on the link.
- Click on MEMBER and then click on LOGIN.
- The default Member Name will be your Membership Number.
- If you had Signed Up on line you would have created a Password, but if you have forgotten it, use the Forgot Password link.
- Once you have Logged In, under Member click on Profile.
- Under Profile click on Membership.
- Under Your Current Membership click on Renew Now.
- You will have the choice of paying with a PayPal account or with a Credit Card.
- If you choose Credit Card PayPal will allow you to pay as a Guest

Thank you,  
Rod Girard AVAC Treasurer

News from around the Net

### **NASA's Spherex Telescope Completes Its 1st Cosmic Map Of The Entire Sky And It's Stunning!**

"I think every astronomer is going to find something of value here, as NASA's missions enable the world to answer fundamental questions about how the universe got its start, and how it changed to eventually create a home for us in it." NASA's SPHEREx observatory has completed its first map of the entire sky over Earth, and it is incredible. Beyond its aesthetic value, the map and the rest of the data collected by SPHEREx, which launched in March this year, will help astronomers answer some of the biggest cosmic questions. . . . (continued at <https://www.space.com/astronomy/galaxies/nasas-spherex-telescope-completes-its-1st-cosmic-map-of-the-entire-sky-and-its-stunning> )



### **The Solar System Loses An Ocean World**

Saturn's largest moon, Titan, may not have a subsurface ocean after all. That's according to a re-examination of data captured by NASA's Cassini spacecraft, which flew by Titan dozens of times starting in 2004. By 2008, all the evidence suggested a subsurface ocean of liquid water lay waiting beneath Titan's geologically complex crust. But the latest analysis says the interior is more likely to be made of ice and slush, albeit with pockets of warm water that cycle from core to surface. . . . (continued at <https://www.universetoday.com/articles/the-solar-system-loses-an-ocean-world> )



### **What's Powering These Mysterious, Bright Blue Cosmic Flashes? Astronomers Find A Clue**

Among the more puzzling cosmic phenomena discovered over the past few decades are brief and very bright flashes of blue and ultraviolet light that gradually fade away, leaving behind faint X-ray and radio emissions. With slightly more than a dozen discovered so far, astronomers have debated whether they are produced by an unusual type of supernova or by interstellar gas falling into a black hole. Analysis of the brightest such burst to date, discovered last year, shows that they're neither. . . . (continued at <https://phys.org/news/2025-12-powering-mysterious-bright-blue-cosmic.html> )



### **Rare Image Of Tatooine-Like Planet Is Closest To Its Twin Stars Yet**

In a discovery that's fit for a movie, Northwestern University astronomers have directly imaged a Tatooine-like exoplanet, orbiting two suns. While obtaining an image of a planet beyond our solar system is already rare, finding one that circles two suns is even rarer. But this new world is extra exceptional. It hugs its twin stars more tightly than any other directly imaged planet in a binary system. In fact, it is six times closer to its suns than other previously discovered exoplanets. . . . (continued at [https://phys.org/news/2025-12-rare-image-tatooine-planet-closest.html#google\\_vignette](https://phys.org/news/2025-12-rare-image-tatooine-planet-closest.html#google_vignette) )



### **Darksky International Opposes Reflect Orbital's Proposed Orbital Illumination System**

DarkSky International recently released an organizational statement in response to Reflect Orbital's proposal to use in-space mirrors to reflect sunlight to Earth at night. Grounded in current scientific understanding and guided by the Five Principles of Responsible Outdoor Lighting, the statement clearly articulates DarkSky's opposition to orbital illumination systems as they are currently conceived. The statement aims to inform policymakers, the scientific community, and the public about the significant risks posed by the proposed technology, . . . . (continued at <https://darksky.org/news/organizational-statement-reflect-orbital/> )



### **New Radar Data Chills Prospects Of A Subglacial Lake On Mars**

There is an ongoing scientific battle about the potential existence of a body of liquid water, a subglacial lake, buried almost 1 mile (1.5 kilometers) beneath the south polar ice cap of Mars. New radar data now suggest this lake might not exist. The possibility of a Martian subglacial lake was first proposed in 2018, to explain observations from the Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS) instrument aboard the European Space Agency's (ESA) Mars Express Orbiter. The MARSIS team detected a highly reflective radar signal originating deep underground, at the boundary between the deepest layers of ice and dust above the Martian bedrock . . . . (continued at <https://skyandtelescope.org/astronomy-news/new-radar-data-chills-prospects-of-a-subglacial-lake-on-mars/> )



## Space News

News from around the Net

### **What Are Asteroids Really Made Of? New Analysis Brings Space Mining Closer To Reality**

Scientists still have much to learn about what small asteroids are made of. These rocky bodies may contain valuable metals, ancient material left over from the formation of the solar system, and chemical clues that reveal the history of their original parent bodies. Because of this, they are increasingly viewed as possible sources of future space resources. . . . The findings also help scientists identify where these meteorites came from and support planning for future space missions and resource extraction technologies. . . (continued at <https://www.sciencedaily.com/releases/2025/12/251224032404.htm> )



### **Dec. 25, 1642: The Birth Of Isaac Newton**

Born Dec. 25, 1642, Isaac Newton is likely best known for his conception of the theory of gravity. But there were many more layers to him: In June 1665, with the plague burning through England, Newton left school at the University of Cambridge and returned to his family farm at Woolsthorpe Manor in Lincolnshire after the university closed. Here, he lived for two years in near isolation and produced the greatest creative output of his life. It's easy to think of Newton only as a lonely and antisocial genius sitting at a desk, unraveling the mysteries of the universe. Yet there is so much more. In his lifetime, Newton vigorously conducted experiments and constructed models, wrote one of the most influential science texts of all time and built the first usable reflecting telescope. . . . (continued at <https://www.astronomy.com/today-in-the-history-of-astronomy/dec-25-1642-the-birth-of-isaac-newton/> )



### **The Chaotic 'Dracula's Chivito': Hubble Reveals Largest Birthplace Of Planets Ever Observed**

Astronomers using NASA's Hubble Space Telescope have imaged the largest protoplanetary disk ever observed circling a young star. For the first time in visible light, Hubble has revealed the disk is unexpectedly chaotic and turbulent, with wisps of material stretching much farther above and below the disk than astronomers have seen in any similar system. Strangely, more extended filaments are only visible on one side of the disk. The findings, which were published in The Astrophysical Journal, mark a new milestone for Hubble and shed light on how planets may form in extreme environments, . . . .(continued at <https://phys.org/news/2025-12-chaotic-dracula-chivito-hubble-reveals.html> )



### **Explore Orion's Massive New Stars With Binoculars**

Some constellations have all the luck. Orion not only has one of the most recognizable forms, including its signature Belt, but it contains two of the top 10 brightest nighttime stars (Rigel and Betelgeuse), three 2nd-magnitude stars and M42, the Orion Nebula, one of the brightest and most important star-forming regions in the galaxy. No wonder it sparkles on winter nights. Giving birth to new suns is what Orion is all about. The celestial Hunter is home to the lavish Orion Molecular Cloud (OMC), an enormous star-forming region hundreds of light-years across located about 1,500 light-years from Earth that enrobes the constellation. . . . (continued at <https://skyandtelescope.org/astronomy-news/explore-orions-massive-new-stars-with-binoculars/> )



### **Europe's Planet Hunting Spacecraft Complete And Ready For Final Testing**

Engineers have completed the construction of ESA's Plato spacecraft — the mission designed to search for Earth-like planets around Sun-like stars — marking a major milestone before its final round of testing. With its sunshield and solar panels now fitted, Plato (PLANetary Transits and Oscillations of stars) has reached its full flight configuration at the European Space Agency's Test Centre in the Netherlands. "This operation completes the Plato spacecraft," said Thomas Walloschek, ESA's Plato Project Manager. "The combined sunshield and solar array module was the last remaining essential part. It is very satisfying to have reached this moment and to see Plato in its final shape. . . . (continued at <https://astronomynow.com/2025/10/21/europes-planet-hunting-spacecraft-complete-and-ready-for-final-testing/> )



## Hubble Sees Asteroids Colliding At Nearby Star For First Time

[heic2512 — Science Release](#) 18 December 2025

In a historical milestone, catastrophic collisions in a nearby planetary system were witnessed for the first time by astronomers using the NASA/ESA Hubble Space Telescope. As they observed the bright star Fomalhaut, the scientists saw the impact of massive objects around the star. The Fomalhaut system appears to be in a dynamical upheaval, similar to what our solar system experienced in its first few hundred million years after formation.

*“This is certainly the first time I’ve ever seen a point of light appear out of nowhere in an exoplanetary system,”* said principal investigator Paul Kalas of the University of California, Berkeley. *“It’s absent in all of our previous Hubble images, which means that we just witnessed a violent collision between two massive objects and a huge debris cloud unlike anything in our own solar system today. Amazing!”*

Just 25 light-years from Earth, Fomalhaut is one of the brightest stars in the night sky. Located in the constellation Piscis Austrinus, also known as the Southern Fish, it is more massive and brighter than the Sun and is encircled by several belts of dusty debris.

In 2008, scientists used Hubble to discover a candidate planet around Fomalhaut, making it the first stellar system with a possible planet found using visible light. That object, called Fomalhaut b, now appears to be a dust cloud masquerading as a planet – the result of colliding planetesimals. While searching for Fomalhaut b in recent Hubble observations, scientists were surprised to find a second point of light at a similar location around the star. They call this object “circumstellar source 2” or “cs2” while the first object is now known as “cs1.”

### Tackling mysteries of colliding planetesimals

Why astronomers are seeing both of these debris clouds so physically close to each other is a mystery. If the collisions between asteroids and planetesimals were random, cs1 and cs2 should appear by chance at unrelated locations. Yet, they are positioned intriguingly near each other along the inner portion of Fomalhaut’s outer debris disk.

Another mystery is why scientists have witnessed these two events within such a short timeframe. *“Previous theory suggested that there should be one collision every 100,000 years, or longer. Here, in 20 years, we’ve seen two,”* explained Kalas. *“If you had a movie of the last 3,000 years, and it was sped up so that every year was a fraction of a second, imagine how many flashes you’d see over that time. Fomalhaut’s planetary system would be sparkling with these collisions.”*

Collisions are fundamental to the evolution of planetary systems, but they are rare and difficult to study.

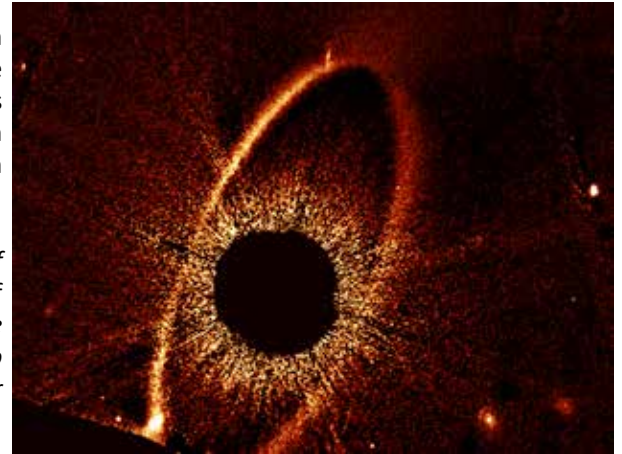
*“The exciting aspect of this observation is that it allows researchers to estimate both the size of the colliding bodies and how many of them there are in the disk, information which is almost impossible to get by any other means,”* said co-author Mark Wyatt at the University of Cambridge in England. *“Our estimates put the planetesimals that were destroyed to create cs1 and cs2 at just 30 kilometres in size, and we infer that there are 300 million such objects orbiting in the Fomalhaut system.”*

*“The system is a natural laboratory to probe how planetesimals behave when undergoing collisions, which in turn tells us about what they are made of and how they formed,”* explained Wyatt.

### Cautionary tale

The transient nature of Fomalhaut cs1 and cs2 poses challenges for future space missions aiming to directly image exoplanets. Such telescopes may mistake dust clouds like cs1 and cs2 for actual planets.

*“Fomalhaut cs2 looks exactly like an extrasolar planet reflecting starlight,”* said Kalas. *“What we learned from studying cs1 is that a large dust cloud can masquerade as a planet for many years. This is a cautionary note for future missions that aim to detect extrasolar planets in reflected light.”*



*This composite NASA/ESA Hubble Space Telescope image shows the debris ring and dust clouds cs1 and cs2 around the star Fomalhaut. For comparison, dust cloud cs1, imaged in 2012, is pictured with dust cloud cs2, imaged in 2023. The dashed circles mark the location of these clouds. When dust cloud cs2 suddenly appeared, astronomers quickly noticed they had witnessed the violent collision of two massive objects. Previously thought to be a planet, cs1 is now classified as a similar debris cloud. In this image, Fomalhaut itself is masked out to allow the fainter features to be seen.*

*This image was created from Hubble data from proposal #17139 (P. Kalas).  
Credit: NASA, ESA, P. Kalas (UC Berkeley), J. DePasquale (STScI)*

## Looking to the future

Kalas and his team have been granted Hubble time to monitor cs2 over the next three years. They want to see how it evolves -- does it fade, or does it get brighter? Being closer to the dust belt than cs1, the expanding cs2 cloud is more likely to start encountering other material in the belt. This could lead to a sudden avalanche of more dust in the system, which could cause the whole surrounding area to get brighter.

*"We will be tracing cs2 for any changes in its shape, brightness, and orbit over time," said Kalas, "It's possible that cs2 will start becoming more oval or cometary in shape as the dust grains are pushed outward by the pressure of starlight."*

The team also will use the [NIRCam \(Near-Infrared Camera\)](#) instrument on the [NASA/ESA/CSA James Webb Space Telescope](#) to observe cs2. Webb's NIRCam has the ability to provide color information that can reveal the size of the cloud's dust grains and their composition. It can even determine if the cloud contains water ice.

Hubble and Webb are the only observatories capable of this kind of imaging. While Hubble primarily sees in visible wavelengths, Webb could view cs2 in the infrared. These different, complementary wavelengths are needed to provide a broad multi-spectral investigation and a more complete picture of the mysterious Fomalhaut system and its rapid evolution.

This research appears today in the December 18 issue of Science.

## More information

The Hubble Space Telescope is a project of international cooperation between ESA and NASA.

Image Credit: NASA, ESA, P. Kalas (UC Berkeley), J. DePasquale (STScI)

## Links

- [Release on ESA website](#)
- [Release on NASA website](#)
- [Science paper](#)

## Contacts

Bethany Downer

ESA/Hubble Chief Science Communications Officer

Email: [Bethany.Downer@esahubble.org](mailto:Bethany.Downer@esahubble.org)

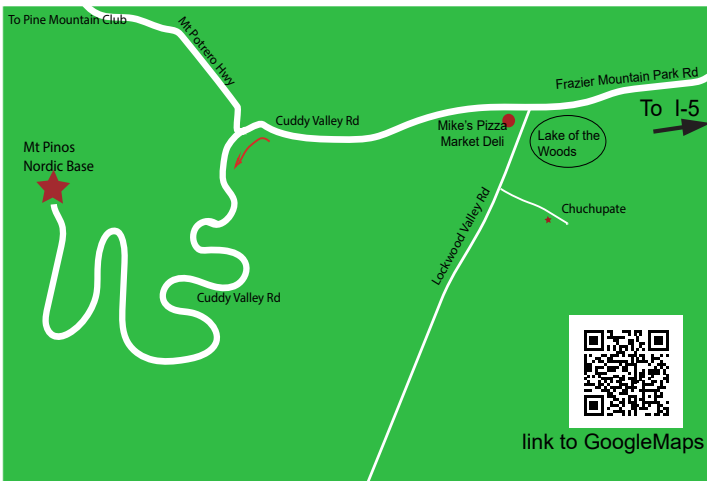
THE OTHER COAST



## Dark Sky Observing Sites

The **Chuchupate** parking lot is a half a mile beyond the Mt Pinos ranger station (on some maps The Chuchupate Ranger Sta.), the parking lot is also called Frazier Mountain trailhead.

To get there, take the Frazier Mountain Park RD east about 7 miles from I-5, to Lake Of The Woods, Turn left on Lockwood Valley Rd. ( If you see Mike’s Pizza on your left you missed the turn) In less than a mile there is a road to the left, go past the ranger station, the parking lot is on the right. The Club gathers in the upper end of the lot. The Elevation is 5430 feet. There is a vault toilet. (link to GoogleMaps) [RX3R+3F, Frazier Park, CA 93225](#)



**Mt Pinos** is a parking lot at 8350 feet for the “Mt Pinos Nordic Base.” There is a vault toilet 300 yds to the east in the Chula Vista campground.

To get there: From I-5, get off at Frazier Mountain Park Rd and drive west about 7 miles to Mike’s Pizza/Market Deli at Lockwood Valley Rd. Keep on the main roadway (don’t turn left to go to Chuchupate). Continue past Mike’s Pizza on Cuddy Valley Rd (the road’s new name) about 5 miles. Continue straight (do not turn right on to Mil Potrero Hwy) for another 8 1/2 miles to the parking area.

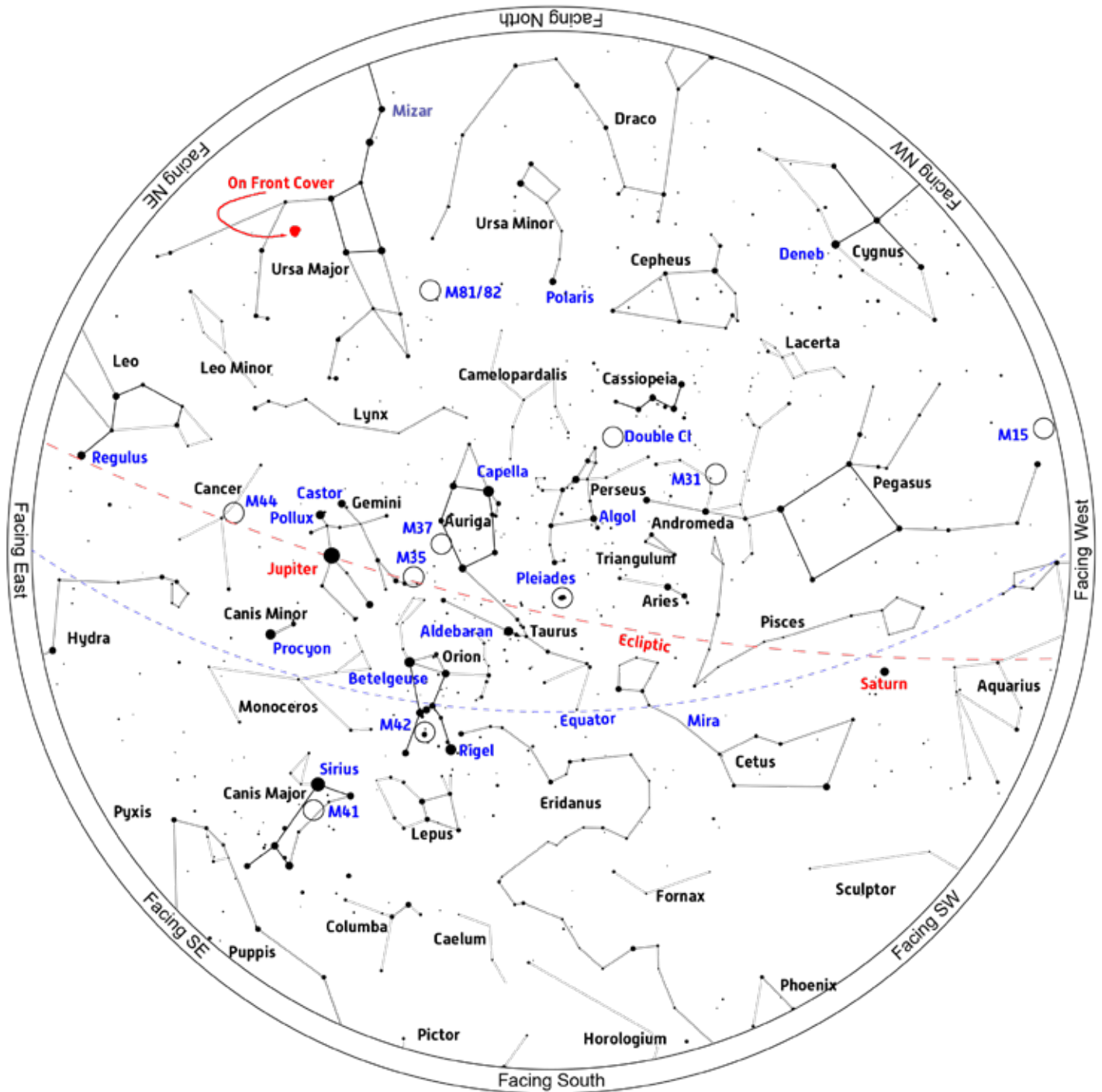
[RV7F+FF Frazier Park, California](#) (link to GoogleMaps)

**The Red Cliffs Natural Area** is part of **Red Rock Canyon State Park** is a day use area and is not for use by the public after dark. The Club gets a special permit for a star party and pays a fee.

To get there: Take the CA-14 north 25 miles past Mojave. You will see giant red cliffs on the right side and a small sign that says “Red Cliffs Natural Area” and a dirt road. (If you see the large sign for the Ricardo campground, you drove a mile too far). Follow the road to the large parking lot (that hasn’t been graded in a long time). Elevation is 2410 feet. There is a vault toilet. . . . (link to GoogleMaps). [926F+X5 Ricardo, California](#)



## Sky Chart



Location: Palmdale, CA 93551  
Latitude: 34° 36' N, longitude: 118° 11' W  
Time: 2026 January 17, 20:00 (UTC -08:00)

Powered by: Heavens-Above.com

## Solar System Summary

The **Sun** starts the month in northern Sagittarius ending the month right in the middle of Capricorn.

### The Planets

**Mercury** ends it's stay in the morning sky. On the 21st it achieves solar conjunction and passes Pluto, on the 17th Mars, and on the 28th Venus.

**Venus**, on the 1st is just over 1° west of the Sun getting ready for its conjunction on 5th, and passes by Mars on the 7th going the other direction.

**Mars** is giving up on the evening twilight as it falls toward the setting Sun. On the 7th Mars passes by Venus, and on the 9th enters solar conjunction and bursts into the morning twilight.

**Jupiter** is still in Gemini moving in retrograde motion and will be at opposition on January 10, at 4.23 Au.

**Saturn** moving in normal motion in the northeast Aquarius crossing into southern Pisces at the end of the month at mag 1.1.

**Uranus** past opposition, moving in retrograde motion at mag 5.6 in eastern Taurus, less than 5° south of the Pleiades.

**Neptune** in normal motion in southern Pisces at mag 7.9. The 20% waxing Moon passes 2½° north on the 23rd (6 hours after it sets).

### Dwarf Planets

**134340 Pluto** still moving normally in western Capricorn, at mag 14.5. On the 21st Pluto passes into the morning twilight.

**1 Ceres** spends the month in normal motion moving across Cetus at mag 8.8.

**2 Pallas** continues moving normally in eastern Aquarius, south of M2, at the end of the month, at magnitude 10.3.

**3 Juno** continues moving normally from southern Serpens Cauda and moves across Scutum at mag 11.2.

**4 Vesta** moves in normal motion from across central Sagittarius winding up in the middle of Capricorn at mag 7.6 at solar conjunction.

## Moon Phases



First Qtr Jan 25      Full Jan 3      Third Qtr Jan 10      New Jan 18

## Sun and Moon Rise and Set\*

Date	Moonrise	Moonset	Sunrise	Sunset
1/1/2026	15:00	05:24	06:59	16:53
1/5/2026	19:47	08:59	07:00	16:56
1/10/2026	00:51	11:14	07:00	17:00
1/15/2026	04:47	14:12	06:59	17:05
1/20/2026	08:17	19:12	06:57	17:10
1/25/2026	10:36	00:37	06:55	17:15
1/30/2026	14:57	05:18	06:52	17:20

## Planet Data\*

January 1

	Rise	Transit	Set	Mag	Phase%
Mercury	06:15	11:06	15:58	-0.6	95.5
Venus	06:58	11:52	16:45	-3.9	99.9
Mars	07:13	12:05	16:58	1.2	99.9
Jupiter	17:30	00:40	07:47	-2.7	99.9
Saturn	11:04	16:56	22:48	1.1	99.7

January 15

	Rise	Transit	Set	Mag	Phase%
Mercury	06:54	11:48	16:42	-1.1	99.4
Venus	07:13	12:12	17:12	-3.9	99.9
Mars	16:59	11:56	16:54	1.2	99.9
Jupiter	16:26	23:33	06:45	-2.7	99.9
Saturn	10:11	16:04	21:57	1.1	99.8

January 30

	Rise	Transit	Set	Mag	Phase%
Mercury	07:21	12:35	17:48	-1.2	97.5
Venus	07:17	12:31	17:45	-3.9	99.4
Mars	06:41	11:46	16:52	1.2	99.8
Jupiter	15:18	22:27	05:39	-2.7	99.8
Saturn	09:15	15:10	21:05	1.1	99.8

\*All time mentioned are local and approximate.

\*Sun, Moon and Planetary date based on Quartz Hill, CA

## Suggested Observing List

The list below contains objects that will be visible on the night of the AVAC Deep Sky Star Party or the Saturday nearest the New Moon, in this case January 17, 2026. The list is sorted by the transit time of the object.

ID	Common Name	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC7380		Open	Cep	22h 47m 21s	+58°07.9'	7.2	Circ	14:54	Circ
C9	Cave Nebula	BrNeb	Cep	22h 56m 48s	+62°37.0'		Circ	15:04	Circ
IC1470		Neb	Cep	23h 05m 10s	+60°14.6'		Circ	15:12	Circ
NGC7492		Globular	Aqr	23h 08m 27s	-15°36.6'	11.5	09:57	15:15	20:34
HR8872	34 Cep	Triple	Cep	23h 18m 38s	+68°06.6'	4.8	Circ	15:26	Circ
IC5308		Galaxy	Gru	23h 19m 21s	-42°15.4'	12.0	11:57	15:26	18:56
M52	The Scorpion	Open	Cas	23h 24m 48s	+61°35.6'	8.0	Circ	15:32	Circ
NGC7662	Blue Snowball	P Neb	And	23h 25m 54s	+42°33.0'	8.3	06:51	15:33	00:15
NGC7686		Open	And	23h 30m 07s	+49°08.0'	5.6	05:58	15:37	01:16
IC5332		Galaxy	Scl	23h 34m 27s	-36°06.0'	10.6	11:38	15:41	19:44
NGC7785		Galaxy	Psc	23h 55m 19s	+05°54.9'	11.6	09:43	16:02	22:21
HR9071	8 Cas	Triple	Cas	23h 59m 01s	+55°45.3'	4.9	Circ	16:06	Circ
NGC7822		Neb	Cep	00h 03m 36s	+67°09.0'		Circ	16:11	Circ
NGC55	C72	S Gal	Scl	00h 14m 54s	-39°11.0'	7.9	12:35	16:22	20:09
NGC129		Open	Cas	00h 30m 00s	+60°13.1'	6.5	Circ	16:37	Circ
NGC133		Open	Cas	00h 31m 19s	+63°21.0'	9.0	Circ	16:38	Circ
NGC146		Open	Cas	00h 33m 03s	+63°18.0'	9.1	Circ	16:40	Circ
NGC147	C17	E Gal	Cas	00h 33m 12s	+48°30.0'	9.3	07:08	16:40	02:12
NGC190		Galaxy	Psc	00h 38m 55s	+07°03.7'	14.0	10:23	16:46	23:08
M110	Satellite Of Andromeda Galaxy	Galaxy	And	00h 40m 22s	+41°41.1'	8.9	08:11	16:47	01:24
NGC210		Galaxy	Cet	00h 40m 35s	-13°52.3'	10.9	11:24	16:48	22:11
NGC206	V-36	Neb	And	00h 40m 36s	+40°44.0'		08:17	16:48	01:18
Arp168	M32	Galaxy	And	00h 42m 41s	+40°51.0'	9.0	08:18	16:50	01:21
M32	Satellite Of Andromeda Galaxy	Galaxy	And	00h 42m 42s	+40°51.9'	9.1	08:18	16:50	01:21
M31	Andromeda Galaxy	Galaxy	And	00h 42m 44s	+41°16.1'	4.3	08:16	16:50	01:24
NGC246	C56	P Neb	Cet	00h 47m 00s	-11°53.0'	10.9	11:25	16:54	22:23
NGC254		Galaxy	Scl	00h 47m 28s	-31°25.2'	11.8	12:31	16:54	21:18
NGC288		Globular	Scl	00h 52m 45s	-26°35.0'	8.1	12:17	17:00	21:42
NGC281	PacMan Nebula	Open	Cas	00h 52m 54s	+56°37.4'	7.0	Circ	17:00	Circ
IC59	γ Cassiopeiae Nebula	Neb	Cas	00h 57m 29s	+61°08.6'		Circ	17:04	Circ
IC63	γ Cassiopeiae Nebula	Neb	Cas	00h 59m 29s	+60°54.7'		Circ	17:06	Circ
C51	IC1613	IrrGal	Cet	01h 04m 48s	+02°07.0'	9.3	11:03	17:12	23:20
NGC474		Galaxy	Psc	01h 20m 07s	+03°24.9'	11.1	11:15	17:27	23:39
NGC485		Galaxy	Psc	01h 21m 28s	+07°01.0'	14.0	11:06	17:28	23:51

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January 2026

ID	Common Name	Type	Const	RA	Dec	Mag	Rise	Transit	Set
M103	NGC581	Open	Cas	01h 33m 23s	+60°39.0'	7.0	Circ	17:40	Circ
NGC598	Triangulum Pinwheel Galx	Galaxy	Tri	01h 33m 51s	+30°39.6'	5.7	10:01	17:41	01:21
NGC604	III-150	Neb	Tri	01h 34m 33s	+30°47.0'		10:01	17:41	01:22
M74	The Phantom	Galaxy	Psc	01h 36m 42s	+15°47.0'	9.8	10:56	17:44	00:32
M76	Little Dumbbell Nebula	P Neb	Per	01h 42m 18s	+51°34.2'	12.0	07:38	17:49	04:01
NGC651	Apple Core Nebula [2]	P Neb	Per	01h 42m 21s	+51°34.1'	12.2	07:38	17:49	04:01
NGC637		Open	Cas	01h 43m 04s	+64°02.4'	8.2	Circ	17:50	Circ
NGC654		Open	Cas	01h 44m 00s	+61°53.0'	6.5	Circ	17:51	Circ
NGC720		Galaxy	Cet	01h 53m 00s	-13°44.3'	10.2	12:36	18:00	23:24
NGC780		Galaxy	Tri	02h 00m 35s	+28°13.5'	14.0	10:37	18:08	01:38
NGC784		Galaxy	Tri	02h 01m 17s	+28°50.2'	11.8	10:35	18:08	01:41
NGC821		Galaxy	Ari	02h 08m 21s	+10°59.6'	10.8	11:42	18:15	00:49
Baily191	NGC884	Open	Per	02h 22m 18s	+57°08.1'	4.0	Circ	18:29	Circ
IC1795		Neb	Cas	02h 26m 32s	+62°02.4'		Circ	18:33	Circ
NGC936		Galaxy	Cet	02h 27m 37s	-01°09.3'	10.1	12:35	18:35	00:34
NGC943	Arp309	Galaxy	Cet	02h 29m 09s	-10°49.0'	11.4	13:04	18:36	00:09
NGC956		Open	And	02h 32m 30s	+44°35.6'	9.0	09:42	18:39	03:36
IC1805	Heart Nebula	Open	Cas	02h 32m 47s	+61°27.6'	6.5	Circ	18:40	Circ
NGC1052		Galaxy	Cet	02h 41m 05s	-08°15.3'	10.6	13:08	18:48	00:28
M34	Spiral Cluster	Open	Per	02h 42m 05s	+42°45.6'	6.0	10:05	18:49	03:33
M77	Cetus A	Galaxy	Cet	02h 42m 41s	-00°00.8'	9.7	12:47	18:50	00:52
NGC1084		Galaxy	Eri	02h 46m 00s	-07°34.6'	10.6	13:11	18:53	00:35
IC1848	Soul Nebula	Open	Cas	02h 51m 18s	+60°24.4'	6.5	Circ	18:58	Circ
NGC1156		Galaxy	Ari	02h 59m 42s	+25°14.2'	11.7	11:47	19:07	02:26
NGC1201		Galaxy	For	03h 04m 08s	-26°04.1'	10.6	14:27	19:11	23:55
NGC1175		Galaxy	Per	03h 04m 32s	+42°20.3'	12.8	10:31	19:11	03:52
HR963	Alp For	Dbl	For	03h 12m 04s	-28°59.2'	3.9	14:46	19:19	23:52
NGC1316	Fornax A	Galaxy	For	03h 22m 42s	-37°12.4'	8.9	15:32	19:30	23:27
Barnard202	B202	DkNeb	Ari	03h 25m 38s	+30°16.0'		11:54	19:33	03:11
NGC1350		Galaxy	For	03h 31m 08s	-33°37.7'	10.5	15:24	19:38	23:52
Barnard1	B1	DkNeb	Per	03h 32m 57s	+31°09.0'		11:58	19:40	03:22
NGC1407		Galaxy	Eri	03h 40m 12s	-18°34.8'	9.8	14:38	19:47	00:56
IC347		Galaxy	Eri	03h 42m 32s	-04°17.9'	13.0	13:59	19:49	01:40
NGC1448		Galaxy	Hor	03h 44m 32s	-44°38.6'	11.0	16:38	19:51	23:05
IC348		Open	Per	03h 44m 34s	+32°09.7'	7.3	12:05	19:52	03:38
M45	Pleiades	Open	Tau	03h 47m 30s	+24°07.0'	1.6	12:39	19:54	03:10
Barnard5	B5	DkNeb	Per	03h 47m 53s	+32°53.0'		12:05	19:55	03:45
NGC1461		Galaxy	Eri	03h 48m 27s	-16°23.5'	11.7	14:39	19:55	01:11

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January 2026

ID	Common Name	Type	Const	RA	Dec	Mag	Rise	Transit	Set
IC353		Neb	Tau	03h 53m 00s	+25°48.0'		12:39	20:00	03:21
IC2003		P Neb	Per	03h 56m 22s	+33°52.5'	13.0	12:09	20:03	03:58
NGC1499	California Nebula	Neb	Per	04h 03m 14s	+36°22.0'		12:04	20:10	04:16
NGC1515		Galaxy	Dor	04h 04m 03s	-54°06.0'	11.0	18:47	20:11	21:35
NGC1496		Open	Per	04h 04m 32s	+52°39.7'	10.0	09:41	20:11	06:42
NGC1502		Open	Cam	04h 07m 50s	+62°19.8'	5.7	Circ	20:15	Circ
IC360		Neb	Tau	04h 09m 00s	+26°06.0'		12:54	20:16	03:38
NGC1514	Crystal Ball Nebula	P Neb	Tau	04h 09m 17s	+30°46.5'	10.0	12:36	20:16	03:57
NGC1513		Open	Per	04h 09m 57s	+49°30.8'	8.4	10:33	20:17	06:00
IC359		Neb	Tau	04h 12m 28s	+27°42.1'		12:51	20:19	03:48
NGC1535		P Neb	Eri	04h 14m 16s	-12°44.3'	10.0	14:54	20:21	01:48
Barnard10	B10	DkNeb	Tau	04h 18m 41s	+28°16.0'		12:55	20:26	03:56
NGC1545		Open	Per	04h 20m 57s	+50°15.2'	6.2	10:35	20:28	06:20
NGC1569		Galaxy	Cam	04h 30m 49s	+64°50.8'	11.2	Circ	20:38	Circ
NGC1582		Open	Per	04h 31m 53s	+43°49.0'	7.0	11:48	20:39	05:30
NGC1560		Galaxy	Cam	04h 32m 48s	+71°52.7'	11.5	Circ	20:40	Circ
Barnard19	B19	DkNeb	Tau	04h 33m 00s	+26°16.0'		13:17	20:40	04:03
Barnard20	B20	DkNeb	Per	04h 37m 04s	+50°58.0'		10:42	20:44	06:46
Barnard22	B22	DkNeb	Tau	04h 38m 00s	+26°03.0'		13:23	20:45	04:07
Barnard14	B14	DkNeb	Tau	04h 39m 59s	+25°44.0'		13:26	20:47	04:08
IC2087		Neb	Tau	04h 40m 00s	+25°44.5'		13:26	20:47	04:08
Barnard23	B23	DkNeb	Tau	04h 40m 33s	+29°52.0'		13:11	20:47	04:24
NGC1624		Open	Per	04h 40m 36s	+50°27.6'	10.4	10:52	20:48	06:43
NGC1640		Galaxy	Eri	04h 42m 14s	-20°26.0'	11.7	15:46	20:49	01:53
NGC1647		Open	Tau	04h 45m 55s	+19°06.8'	6.4	13:54	20:53	03:51
IC2118	Witch Head Nebula	Neb	Eri	05h 04m 54s	-07°15.0'		15:29	21:12	02:54
NGC1851	C73	Globular	Col	05h 14m 06s	-40°03.0'	7.3	17:39	21:21	01:03
IC405	Flaming Star Nebula	Neb	Aur	05h 16m 29s	+34°21.3'		13:27	21:23	05:20
M79	NGC1904	Globular	Lep	05h 24m 11s	-24°31.4'	8.5	16:41	21:31	02:21
M38	Starfish Cluster	Open	Aur	05h 28m 40s	+35°50.8'	7.0	13:32	21:36	05:39
M1	Crab Nebula	SNR	Tau	05h 34m 32s	+22°00.8'	8.4	14:34	21:41	04:49
M42	Great Orion Nebula	Open+D Neb	Ori	05h 35m 16s	-05°23.4'	4.0	15:54	21:42	03:30
M43	De Mairan's Nebula	D Neb	Ori	05h 35m 31s	-05°16.0'	9.0	15:54	21:42	03:31
M36	Pinwheel Cluster	Open	Aur	05h 36m 18s	+34°08.3'	6.5	13:48	21:43	05:39
M78	NGC2068	D Neb	Ori	05h 46m 45s	+00°04.8'	8.0	15:51	21:54	03:57
M37	Auriga Salt-and-pepper Cluster	Open	Aur	05h 52m 18s	+32°33.2'	6.0	14:11	21:59	05:48
M35	NGC2168	Open	Gem	06h 09m 00s	+24°21.0'	5.5	15:00	22:16	05:32
M41	Little Beehive	Open	CMa	06h 46m 01s	-20°45.3'	5.0	17:51	22:53	03:55

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January 2026

ID	Common Name	Type	Const	RA	Dec	Mag	Rise	Transit	Set
M50	Heart-shaped Cluster	Open	Mon	07h 02m 42s	-08°23.0'	7.0	17:30	23:10	04:49
M47	NGC2422	Open	Pup	07h 36m 35s	-14°29.0'	4.5	18:22	23:44	05:05
M46	NGC2437	Open	Pup	07h 41m 46s	-14°48.6'	6.5	18:28	23:49	05:10
M93	NGC2447	Open	Pup	07h 44m 30s	-23°51.4'	6.5	18:59	23:51	04:43
M48	NGC2548	Open	Hya	08h 13m 43s	-05°45.0'	5.5	18:34	00:21	06:07
M44	Beehive Cluster	Open	Cnc	08h 40m 24s	+19°40.0'	4.0	17:47	00:47	07:48
M67	King Cobra	Open	Cnc	08h 51m 18s	+11°48.0'	7.5	18:22	00:58	07:34
M81	Bode's Galaxy	Galaxy	UMa	09h 55m 33s	+69°03.9'	7.8	Circ	02:02	Circ
M82	Cigar Galaxy	Galaxy	UMa	09h 55m 53s	+69°40.8'	9.2	Circ	02:03	Circ
M95	NGC3351	Galaxy	Leo	10h 43m 58s	+11°42.2'	10.6	20:15	02:51	09:27
M96	NGC3368	Galaxy	Leo	10h 46m 46s	+11°49.2'	10.1	20:18	02:54	09:30
M105	NGC3379	Galaxy	Leo	10h 47m 50s	+12°34.9'	10.5	20:16	02:55	09:33
M108	NGC3556	Galaxy	UMa	11h 11m 31s	+55°40.4'	10.6	Circ	03:18	Circ
M97	Owl Nebula	P Neb	UMa	11h 14m 48s	+55°01.1'	12.0	Circ	03:22	Circ
M65	Leo Triplet	Galaxy	Leo	11h 18m 56s	+13°05.5'	10.1	20:46	03:26	10:06
M66	Leo Triplet	Galaxy	Leo	11h 20m 15s	+12°59.4'	9.7	20:48	03:27	10:07
M109	NGC3992	Galaxy	UMa	11h 57m 36s	+53°22.4'	10.6	17:18	04:05	14:51
M98	NGC4192	Galaxy	Com	12h 13m 48s	+14°54.0'	10.9	21:35	04:21	11:06
M99	Coma Pinwheel Galaxy	Galaxy	Com	12h 18m 50s	+14°25.0'	10.4	21:42	04:26	11:10
M106	NGC4258	Galaxy	CVn	12h 18m 58s	+47°18.2'	9.1	19:06	04:26	13:46
M61	Swelling Spiral	Galaxy	Vir	12h 21m 55s	+04°28.3'	10.1	22:14	04:29	10:44
M40	Winnecke 4	Dbl+Asterism	UMa	12h 22m 12s	+58°05.0'	8.7	Circ	04:29	Circ
M100	Mirror of M99	Galaxy	Com	12h 22m 55s	+15°49.3'	10.1	21:42	04:30	11:18
M84	NGC4374	Galaxy	Vir	12h 25m 04s	+12°53.2'	10.2	21:53	04:32	11:11
M85	NGC4382	Galaxy	Com	12h 25m 24s	+18°11.4'	10.0	21:37	04:32	11:28
M86	NGC4406	Galaxy	Vir	12h 26m 12s	+12°56.7'	9.9	21:54	04:33	11:13
M49	NGC4472	Galaxy	Vir	12h 29m 47s	+08°00.0'	9.3	22:12	04:37	11:02
M87	Smoking Gun	Galaxy	Vir	12h 30m 49s	+12°23.4'	9.6	22:00	04:38	11:16

And - Andromeda  
Ant - Antlia  
Aps - Apus  
Aql - Aquila  
Aqr - Aquarius  
Ara - Ara  
Ari - Aries  
Aur - Auriga  
Boo - Bootes  
Cae - Caelum  
Cam - Camelopardis  
Cap - Capricornus  
Car - Carina  
Cas - Cassiopeia  
Cen - Centaurus  
Cep - Cepheus  
Cet - Cetus  
Cha - Chamaeleon

Cir - Circinus  
CMa - Canis Major  
CMi - Canis Minor  
Cnc - Cancer  
Col - Columba  
Com - Coma Berenices  
CrA - Corona Australis  
CrB - Corona Borealis  
Crt - Crater  
Cru - Crux  
Crv - Corvus  
CVn - Canes Venatici  
Cyg - Cygnus  
Del - Delphinus  
Dor - Dorado  
Dra - Draco  
Equ - Equuleus  
Eri - Eridanus

For - Fornax  
Gem - Gemini  
Gru - Grus  
Her - Hercules  
Hor - Horologium  
Hya - Hydra  
Hyi - Hydrus  
Ind - Indus  
Lac - Lacerta  
Leo - Leo  
Lep - Lepus  
Lib - Libra  
LMi - Leo Minor  
Lup - Lupus  
Lyn - Lynx  
Lyr - Lyra  
Men - Mensa  
Mic - Microscopium

Mon - Monoceros  
Mus - Musca  
Nor - Norma  
Oct - Octans  
Oph - Ophiuchus  
Ori - Orion  
Pav - Pavo  
Peg - Pegasus  
Per - Perseus  
Phe - Phoenix  
Pic - Pictor  
PsA - Pisces Austrinus  
Psc - Pisces  
Pup - Puppis  
Pyx - Pyxis  
Ret - Reticulum  
Scl - Sculptor  
Sco - Scorpius

Sct - Scutum  
Ser - Serpens  
Sex - Sextans  
Sge - Sagitta  
Sgr - Sagittarius  
Tau - Taurus  
Tel - Telescopium  
TrA - Triangulum Australe  
Tri - Triangulum  
Tuc - Tucana  
UMa - Ursa Major  
UMi - Ursa Minor  
Vel - Vela  
Vir - Virgo  
Vol - Volans  
Vul - Vulpecula

## Greek Alphabet

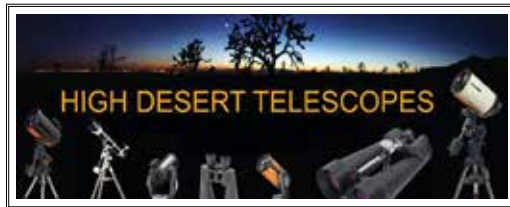
α - alpha	ν - nu
β - beta	ξ - xi
γ - gamma	ο - omicron
δ - delta	π - pi
ε - epsilon	ρ - rho
ζ - zeta	σ - sigma
η - eta	τ - tau
θ - theta	υ - upsilon
ι - iota	φ - phi
κ - kappa	χ - chi
λ - lambda	ψ - psi
μ - mu	ω - omega

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