PrimeFocus

March 2025

WHEN:

March 21, 2024
Doors open at 7:00pm
Meeting at 7:30pm
Lecture at 8:00pm

WHERE:

Unitarian Church
1893 North Vasco Rd.
Livermore, CA 94551
and via Zoom

TVS QR CODE

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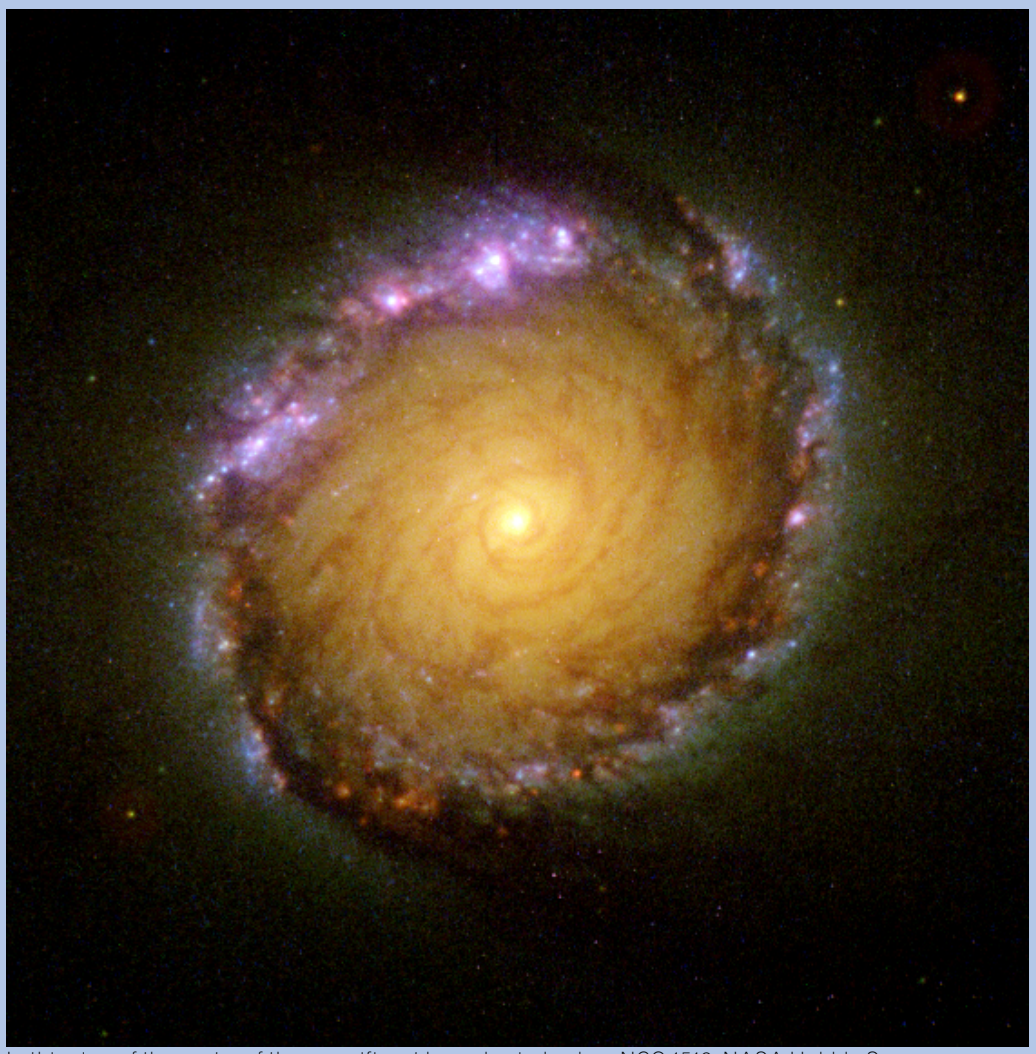
DO GALAXIES BREATHE, TOO?
DR. XINNAN DU

Galaxies are more than just hundreds of billions of stars; the gas that fills the space between the stars plays a crucial role in determining the fate of a galaxy. In this presentation, I'll discuss how we use spectra to study the physical properties of gas in distant galaxies, with a specific focus on how galactic-scale outflows and inflows impact the formation of stars. By studying how galaxies "breathe" (in a similar way to human respiration), we can put together a more comprehensive picture of galaxy evolution over cosmic time.



In this view of the center of the magnificent barred spiral galaxy NGC 1512, NASA Hubble Space Telescope's broad spectral vision reveals the galaxy at all wavelengths from ultraviolet to infrared. The colors (which indicate differences in light intensity) map where newly born star clusters exist in both "dusty" and "clean" regions of the galaxy. NASA, ESA, and D. Maoz (Tel-Aviv University and Columbia University)

Continues to page 2.

Do Galaxies Breathe, Too? continued

Dr. Xinnan Du is the Outreach and Engagement Manager at the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC) at Stanford University. Xinnan got her PhD in astronomy in 2018 from UCLA, and her research is focused on the physical properties of the interstellar and circumgalactic gas in distant star-forming galaxies. Before moving to Northern California, Xinnan spent 3 years at UC Riverside as a postdoctoral scholar, outreach director, and program manager. She is very enthusiastic about public outreach. With a long-term career goal in informal science education, Xinnan hopes to inspire and engage everyone in learning astronomy through various outreach and training programs.

NEWS AND NOTES

2025 Meeting Dates

Club Meeting	Board Meeting	PrimeFocus Deadline
Mar. 21	Mar. 24	Mar. 9
Apr. 18	Apr. 21	Apr. 6
May 18	May 21	May 6

Money Matters

As of the last Treasurer's Report on 2/40/25, our club's account balance is $49,270.74, this includes $13,009.41 in the H2O Rebuild fund.

TVS Welcomes New Members

TVS welcomes new members John Rodriquez, Sarika Gole, Richard Gregor, Robert Bourque, and Yagnik Chilamakuri. Please say hello and chat with them during our meetings.

2025 TVS Club Star Party Schedule

Save the dates for the 2025 Club Star Parties.
Del Valle star parties are also public outreach events. They are jointly hosted with the EBRPD and held at the Arroyo Staging Area (Coords: 37.6196638, -121.7528899). The public is invited for the first 1.5-2 hours, while club members can stay the remainder of the night.
No events currently scheduled for Del Valle.

Tesla Vintners star parties are open to only club members and their guests. These star parties end at midnight, but participants can leave earlier, should they wish.

April 19: Tesla Vintner's Star Party, 5143 Tesla Rd., Livermore. Set-up at 7:30pm, Observing 8:00-11:30pm.

June 21: Tesla Vintner's Star Party, 5143 Tesla Rd., Livermore. Set-up at 8:00pm, Observing 8:30-11:30pm.

July 19: Tesla Vintner's Star Party, 5143 Tesla Rd., Livermore. Set-up at 7:30pm, Observing 8:00-Midnight.

September 13: Tesla Vintner's Star Party, 5143 Tesla Rd., Livermore. Set-up at 6:30pm, Observing 7:00pm-11-30pm.

H2O Open House star parties are open to only club members and their guests. The open house ends at midnight, and all participants are encouraged to stay the duration. The drive to H2O takes about 1 hour, and the caravan leaves promptly from the corner of Mines and Tesla Rds. No gas stations are available on the route, so be prepared. Admission is $3/car-bring exact change. H2O is a primitive site with two porta-potties. Bring water, food, and warm clothing, as needed. Red flashlights are to be used so observers can preserve their night vision.

June 14: H20 Open House, 5:00pm caravan to H2O PROMPTLY leaves the corner of Mines and Tesla Rds., Livermore. Observing until 11:30pm. Meeting times are tentative.

August 16: H20 Open House, 5:00pm caravan to H2O PROMPTLY leaves the corner of Mines and Tesla Rds., Livermore. Observing until 11:30pm. Meeting times are tentative.

April 2: School star party at John Green Elementary, 3300 Antone Way, Dublin. Set-up 6:30pm, Observing from 7:30-9:30pm.

April 5: Cub Scout star party at Del Valle Arroyo Road Staging Area, Arroyo Road, Livermore. Set-up 6:30pm, Observing from 7:30-9:30pm

April 10: Livermore School District Science Odyssey, Joe Michell School, 1001 Elaine Avenue, Livermore. Set-up 4:00pm, Fair from 5:00-7:00pm.

April 12: Solar observing at Tri-Valley Innovation Fair, Alameda County Fairgrounds, Pleasanton. Set-up 9:00am, Observing from 10:00am-5:00pm.

CALENDAR OF EVENTS

March 21,22, 28, 29
April 4, 5, 11, 12, 18, 19, 7:30-10:30 PM

What	Free Telescope Viewing
Who	Chabot Staff
Where	Chabot Space and Science Center, 10000 Skyline Blvd. Oakland, CA 94619
Cost	Free

Join Chabot astronomers on the Observatory Deck for a free telescope viewing! Weather permitting, this is a chance to explore stars, planets and more through Chabot's historic telescopes. Chabot's three large historic telescopes offer a unique way to experience the awe and wonder of the Universe. Three observatory domes house the Center's 8-inch (Leah, 1883) and 20-inch (Rachel, 1916) refracting telescopes, along with a 36-inch reflecting telescope (Nellie, 2003).

Are the skies clear for viewing tonight? Viewing can be impacted by rain, clouds, humidity and other weather conditions. Conditions can be unique to Chabot because of its unique location in Joaquin Miller Park. Before your visit, check out the Weather Station to see the current conditions at Chabot.

For more information, see:
https://chabotspace.org/events/events-listing/
https://eastbayastro.org/chabot-telescope-status/

April 9, 7:00 PM

What	New Worlds: Analyzing the Atmospheres of Exoplanets with the James Webb Space Telescope
Who	Silicon Valley Astronomy Lecture Series
Where	Smithwick Theater (Bldg. 1000), see: https://foothill.edu/map/
Cost	Free

Over 6000 planets have now been found around other stars, but we only have information about what their atmospheres are like for a few dozen. NASA's powerful James Webb Space Telescope (JWST), which features a 20-foot mirror in space, is currently being used to understand atmospheres. We can look for atmospheres around rocky planets the size of the Earth, and we can measure the abundances of molecules like water, methane, ammonia, and carbon dioxide, in larger planets, of sizes similar to Neptune and Jupiter. In this talk Professor Fortney will describe the latest exoplanet results from JWST as we seek to understand these new worlds.

Jonathan Fortney is the Department Chair of Astronomy and Astrophysics at the University of California, Santa Cruz. He is a planetary astrophysicist who works to understand what planets and their atmospheres are made of, both for exoplanets around other stars and for solar system planets. He has been a member of the science teams for NASA space missions like the Cassini Mission to Saturn and the Kepler Mission, which found over 3000 exoplanets.

April 14, 7:30 PM

What	Searching for Technological Life in the Universe
Who	California Academy of Sciences
Where	Morrison Planetarium; 55 Music Concourse Drive, San Francisco, CA 94118
Cost	Public: $15; Members and seniors: $12

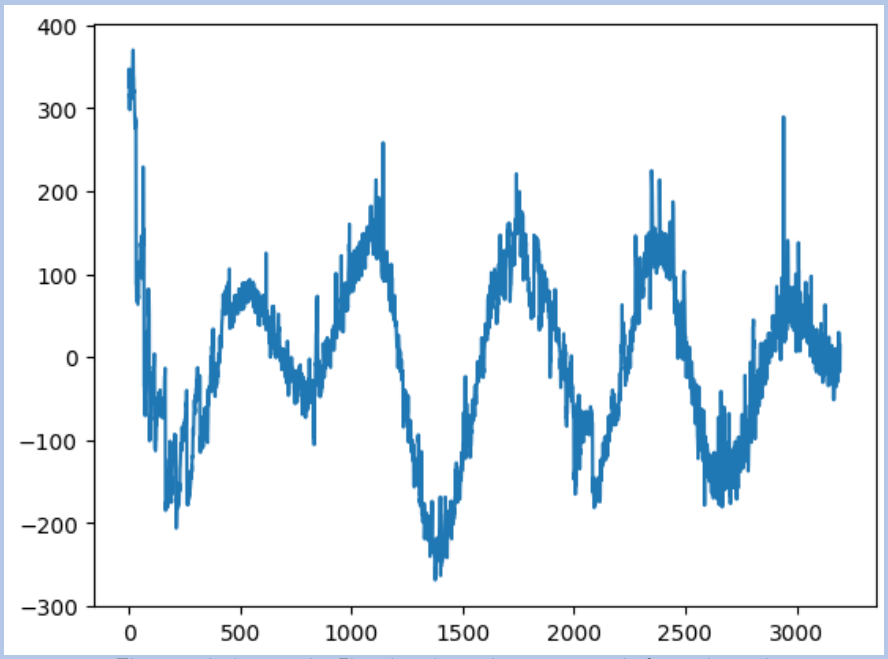
Are we alone? Or is there other life out there in the universe beyond Earth? If there is other life, is it complex life, capable of using language and creating technology like us? Dr. Sofia Sheikh seeks to answer this question by using facilities like the Allen Telescope Array to search for "technosignatures," or signs of non-human technology elsewhere in the universe. In this talk, Dr. Sheikh will describe the current status of technosignature searches, including the history of the field of "SETI" (Search for Extraterrestrial Intelligence), the progress we've made so far in searching for extraterrestrial signals, and the cutting-edge surveys and instruments that will advance our understanding in the years to come.
Dr. Sofia Sheikh is a radio astronomer who works on the search for "technosignatures" (SETI), as well as fast radio bursts, pulsars, and characterization of radio frequency interference. She completed her bachelor's degrees in physics and astronomy at the University of California, Berkeley in 2017, and went on to earn a dual-title PhD in Astronomy & Astrophysics and Astrobiology at Penn State University in 2021. She led radio campaigns with the SETI Institute's Allen Telescope Array as an NSF MPS-Ascend post-doctoral fellow and has recently chosen to continue this work with the SETI Institute as a Technosignature Research Scientist. She hopes, through her career, to help us learn more about the distribution of technological life in the galaxy.

For more information, see:
https://www.calacademy.org/events/benjamin-dean-astronomy-lectures/searching-for-technological-life-in-the-universe

EXOPLANET DETECTION
AVEESH AGRAWAL

What are exoplanets?
Exoplanets are planets outside our solar system that orbit stars. Through imaging and satellites, we have detected and confirmed the existence of thousands of exoplanets. We look for these planets to check for life beyond our own. Are there aliens out there or are we alone in this universe? Now that we know about exoplanets, how do we detect them? This article will outline two different methods. First, we will discuss Transit Photometry. Then, we will cover the Wobble Method.

Transit Photometry
Transit photometry is a method used to detect exoplanets by observing the brightness of the star they orbit. We measure this brightness using flux values. These flux values remain consistent when no object obstructs the line of sight between our sensors and the star. However, when a planet, asteroid, or any debris passes in front of the star, the amount of light detected by our sensor decreases, resulting in a lower flux value during that time. To determine whether the detected dip in brightness is caused by an exoplanet, we look for periodic patterns in the flux values. An exoplanet orbits its star in a regular, repeating manner. If we observe these dips occurring at consistent intervals, we can confirm that we have detected an exoplanet.



This graph depicts the Flux data (y-axis) over a period of time (x-axis)

Machine learning provides an edge in this process as determining a pattern by hand can get extremely complicated. Through machine learning and neural networks, we can code a computer to run through huge amounts of flux data and determine whether we are looking at an exoplanet or not. This reduces the chances of manual errors and streamlines the analysis process. Additionally, Flux datasets can be huge as they depend on the revolution time of an exoplanet. One revolution can take more than a year and we need multiple revolutions to determine an exoplanet. Going through it by hand can be extremely painstaking.

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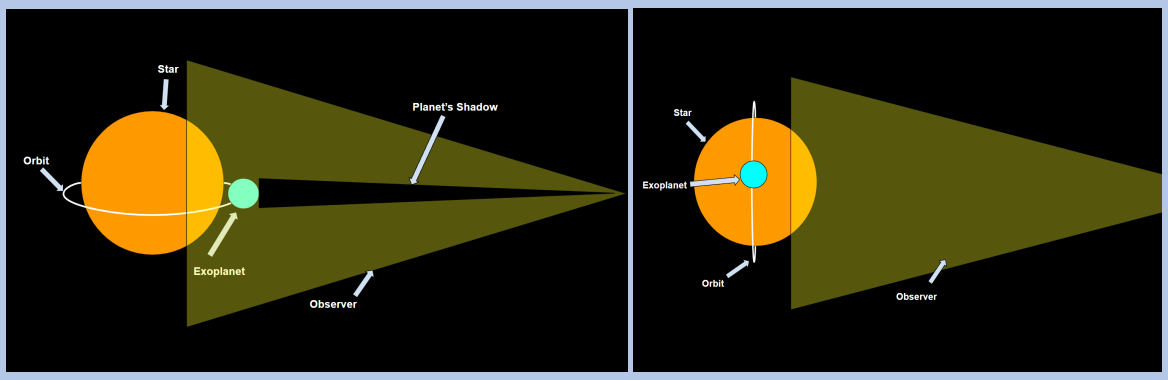
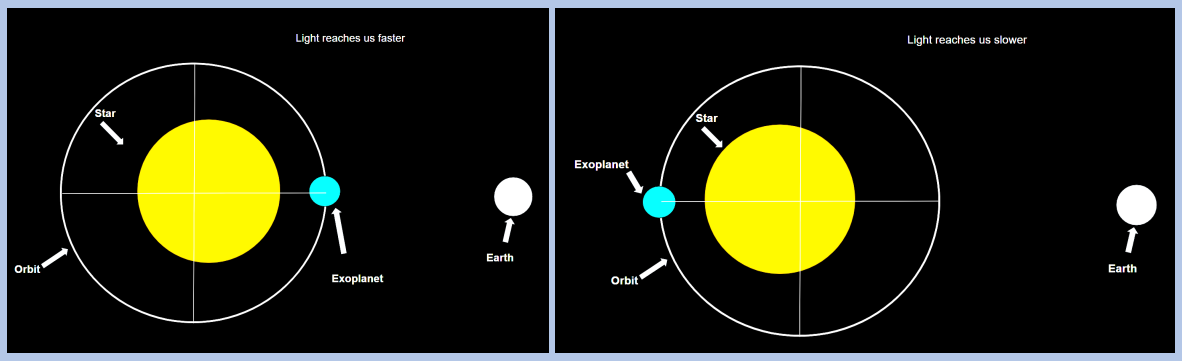
Planet Detection continued



The problem with this method is it can only work in certain conditions. It relies on the fact that the planet's orbit is parallel to our vision and not perpendicular. Looking at the pictures above, you can see that a perpendicular orbit would completely miss our sensor. This is why we can utilize a second method of exoplanet detection.

Wobble Method

According to Newton's Law of Gravity, any object with mass will attract another object with mass. This law applies even to planets and stars. So, if a planet with a perpendicular orbit is orbiting around a star, we can measure the light from the star and see how it has shifted as we observe. The light appears blue or red-shifted as we observe it moving closer or away from the sensor. A repetitive pattern must be present for this to be classified as being caused by an exoplanet.



This method allows us to verify if there is an exoplanet even if it is out of our sight. Again, this has to be measured throughout multiple rotations (the more the better) and machine learning is utilized in this space to make it easier to detect patterns.

My Hunt for Exoplanets

In December 2024, I participated in a project under Inspirit AI, an Artificial Intelligence Program aimed at high school students. We focused on detecting whether data for various celestial objects represented false exoplanets. Using flux data sets and transit photometry, we aimed to determine if the data indicated the presence of an exoplanet.

We developed a machine-learning model incorporating neural networks, linear regression, and several other modeling approaches to identify which would yield the best results. Our initial attempt employed the KNeighborsClassifier, which showed high accuracy. However, we encountered a problem, our dataset consisted primarily of non-exoplanets, leading the model to classify most data points as non-exoplanets, which artificially inflated the accuracy. To address the issue, we switched to a logistic regression model, which provided significantly improved results.

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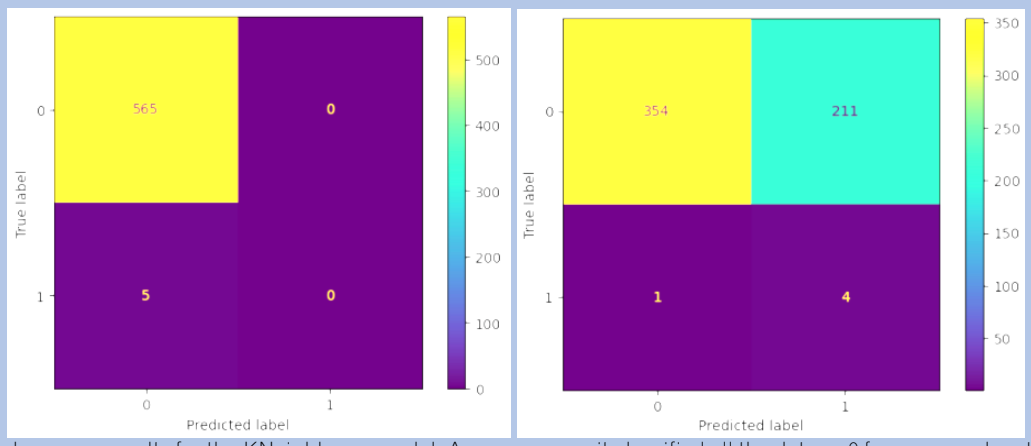
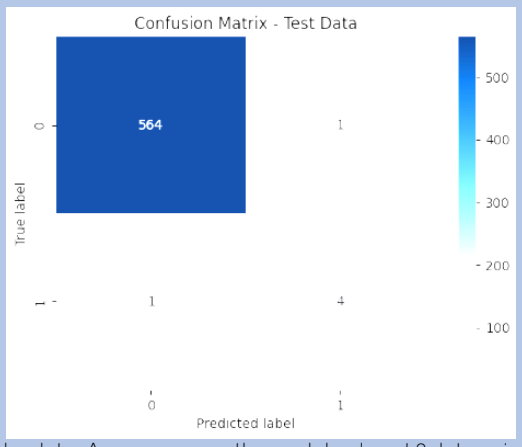
Planet Detection continued



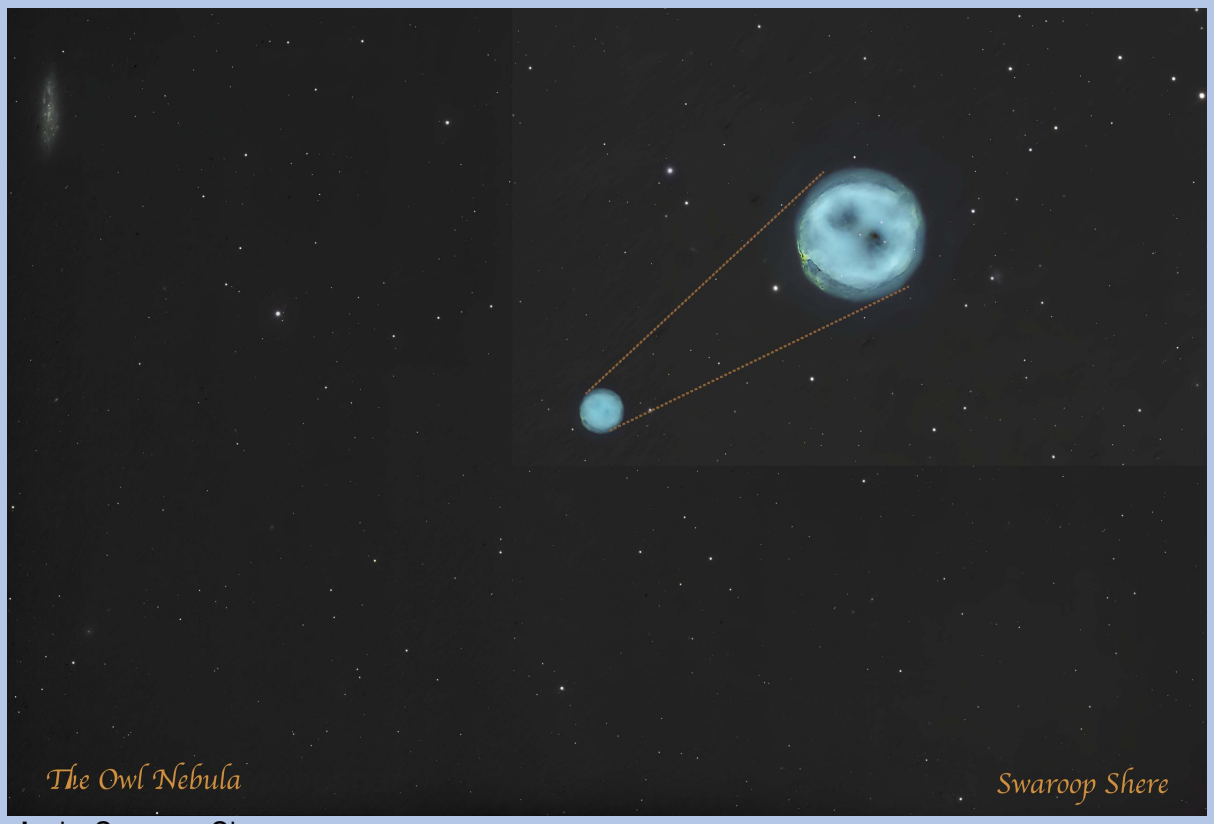
The graph on the left shows our results for the KNeighbours model. As you can see it classified all the data as 0 for non-exoplanets. The graph on the right is our Logistic Regression model. It classified more data as 1 (exoplanet) but made too many data points exoplanets

We then balanced our dataset by generating synthetic data points to ensure more exoplanet data in our training dataset, resulting in much better outcomes.



This is what our graph looked like after altering the data. As you can see the model only got 2 data points wrong, much better than before.

TVS ASTROPHOTOGRAPHY



Owl Nebula, by Swaroop Shere
For a full resolution image see https://app.astrobin.com/?i=njaprg

The Cave Nebula, by Swaroop Shere
For a full resolution image see https://app.astrobin.com/u/swaroopshere?i=4futhr - gallery

Jupiter by Vladimir Afanasiev

Mars by Vladimir Afanasiev

Vladimir Afanasiev giving a presentation to the Moscow Astronomy Club with some of his astrophotography images on the screen in the background

Outer Edge of the Milkyway by Tushar Shanker imaged with his Pixel 9 from Harmony Borax Works, Death Valley National Park on Febuary 23, 2025.

WHATS UP

Adapted from Sky & Telescope

All times are Pacific Standard Time

March 2025

20	Thu	In the morning looking South, Moon is 3° right of Antares
22	Thu	Moon is at third quarter
29	**Fri**	**New Moon;** Partial Solar Eclipse across northeastern North America
30	Fri	Mars is less than ½° lower right of Pollux

April 2025

1	Sat	At dusk Moon is just 1½° above the Pleiades
2	Wed	Moon is 3½° upper right of Jupiter
5	Thu	Moon at first quarter
7	Sat	Moon is 6° above Regulus
		Algol shines at minimum brightness from about 9:48pm to 11:48pm
12	Sun	At dusk Moon and Spica rise in tandum
15	**Fri**	**Full Moon**
17	Sun	In the morning facing southeast to see Moon tailing Antares by about 4°

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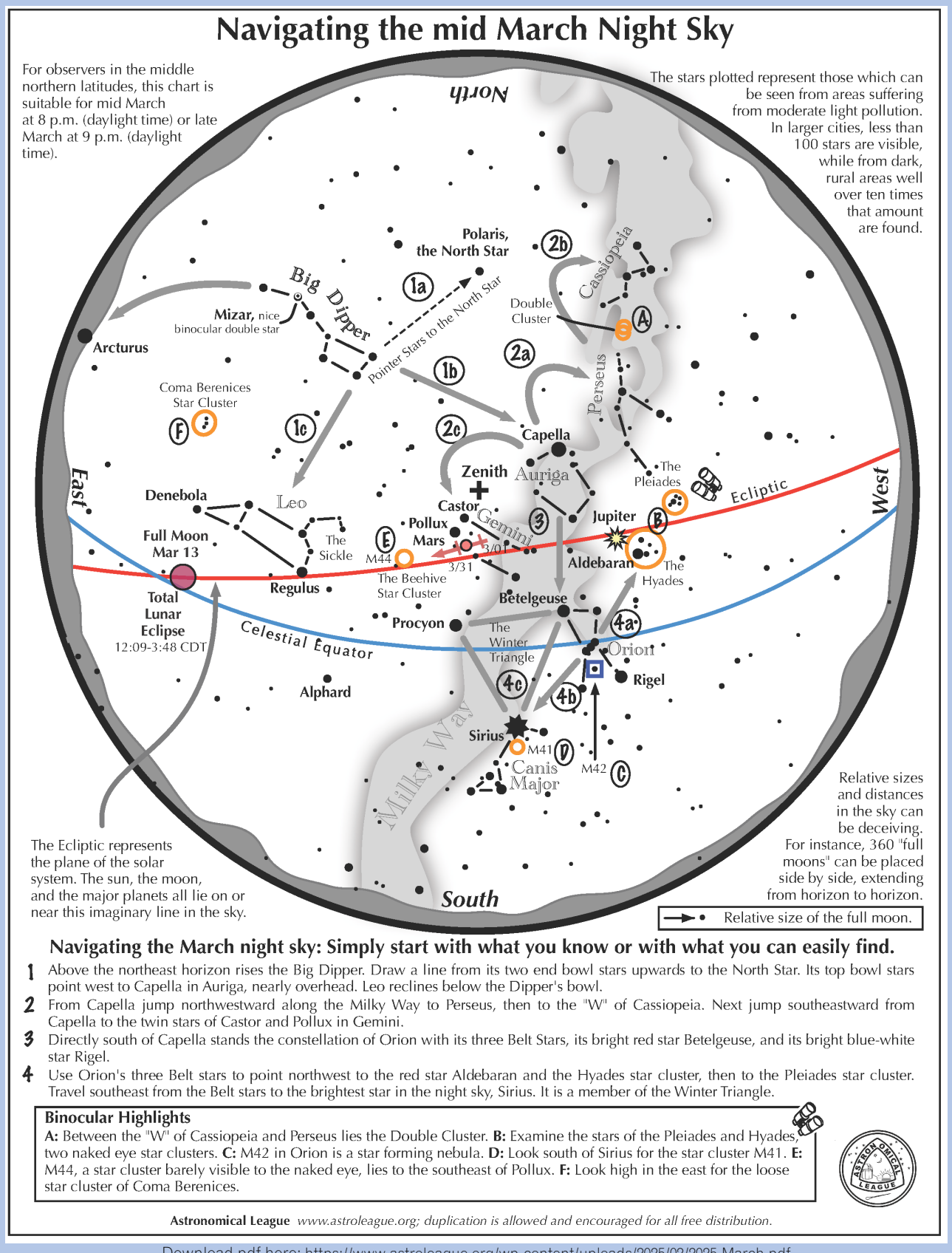
TVS E-Group
To Join the TVS E-Group just send an email to TVS at info@trivalleystargazers.org asking to join the group. Make sure you specify the email address you want to use to read and post to the group.

NAVIGATING THE NIGHT SKY FOR MARCH



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

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

Binocular Highlights

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

Download pdf here: https://www.astroleague.org/wp-content/uploads/2025/02/2025-March.pdf

NASA NIGHT SKY NOTES

Messier Madness
By Kat Troche

March is the start of spring in the Northern Hemisphere; with that, the hunt for Messier objects can begin!

Showing a large portion of M66, this Hubble photo is a composite of images obtained at visible and infrared wavelengths. The images have been combined to represent the real colors of the galaxy. Credit: NASA, ESA and the Hubble Heritage (STScI/AURA)-ESA/Hubble Collaboration; Acknowledgment: Davide De Martin and Robert Gendler

What Are Messier Objects?
During the 18th century, astronomer and comet hunter Charles Messier wanted to distinguish the 'faint fuzzies' he observed from any potential new comets. As a result, Messier cataloged 110 objects in the night sky, ranging from star clusters to galaxies to nebulae. These items are designated by the letter **'M'** and a number. For example, the Orion Nebula is **Messier 42** or **M42**, and the Pleiades are **Messier 45** or **M45**. These are among the brightest 'faint fuzzies' we can see with modest backyard telescopes and some even with our eyes.

Stargazers can catalog these items on evenings closest to the new moon. Some even go as far as having "Messier Marathons," setting up their telescopes and binoculars in the darkest skies available to them, from sundown to sunrise, to catch as many as possible. Here are some items to look for this season:

Continues to page 13

Messier Madness continued

M44 in Cancer and M65 and 66 in Leo can be seen high in the evening sky 60 minutes after sunset. Credit: Stellarium Web

Messier 44 in Cancer: The Beehive Cluster, also known as Praesepe, is an open star cluster in the heart of the Cancer constellation. Use Pollux in Gemini and Regulus in Leo as guide stars. A pair of binoculars is enough to view this and other open star clusters. If you have a telescope handy, pay a visit two of the three galaxies that form the Leo Triplet - **M65** and **M66**. These items can be seen one hour after sunset in dark skies.

Messier 3 Canes Venatici: M3 is a globular cluster of 500,000 stars. Through a telescope, this object looks like a fuzzy sparkly ball. You can resolve this cluster in an 8-inch telescope in moderate dark skies. You can find this star cluster by using the star Arcturus in the Boötes constellation as a guide.

Messier 87 in Virgo: Located just outside of Markarian's Chain, M87 is an elliptical galaxy that can be spotted during the late evening hours. While it is not possible to view the supermassive black hole at the core of this galaxy, you can see M87 and several other Messier-labeled galaxies in the Virgo Cluster using a medium-sized telescope.

Continues to page 14

Messier Madness continued

Locate M3 and M87 rising in the east after midnight. Credit: Stellarium Web

Messier 76 in Perseus: For a challenge, spot the Little Dumbbell Nebula, a planetary nebula between the Perseus and Cassiopeia constellations. With an apparent magnitude of 12.0, you will need a large telescope and dark skies. You can find both M76 and the famous Andromeda Galaxy (M31) one hour after sunset, but only for a limited time, as these objects disappear after April. They will reappear in the late-night sky by September.

Plan Ahead

When gearing up for a long stargazing session, there are several things to remember, such as equipment, location, and provisions:

- **Do you have enough layers to be outdoors for several hours?** You would be surprised how cold it can get when sitting or standing still behind a telescope!
- **Are your batteries fully charged?** If your telescope runs on power, be sure to charge everything before you leave home and pack any additional batteries for your cell phone. Most people use their mobile devices for astronomy apps, so their batteries may deplete faster. Cold weather can also impact battery life.

Continues to page 15

Messier Madness continued

- Determine the **apparent magnitude** of what you are trying to see and the **limiting magnitude** of your night sky. You can learn more about apparent and limiting magnitudes with our Check Your Sky Quality with Orion article.
- When choosing a location to observe from, select an area you are familiar with and bring some friends! You can also **connect with your local astronomy club** to see if they are hosting any Messier Marathons. It's always great to share the stars!

You can see all 110 items and their locations with NASA's Explore the Night Sky interactive map and the Hubble Messier Catalog, objects that have been imaged by the Hubble Space Telescope.

Locate M76 and M31 setting in the west, 60 minutes after sunset. Credit: Stellarium Web

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!

Tri-Valley Stargazers
P.O. Box 2476
Livermore, CA 94551
www.trivalleystargazers.org

Tri-Valley Stargazers Membership Application

Contact information:

Name: _____ Phone: _____

Street Address: _____

City, State, Zip: _____

Email Address: _____

Status (select one): _____ New member _____ Renewing or returning member

Membership category (select one): Membership term is for one calendar year, January through December.

_____ Student member ($10). Must be a full-time high-school or college student.

_____ Regular member ($30).

Hidden Hill Observatory Access (optional): Must be 18 or older.

_____ One-time key deposit ($20). This is a refundable deposit for a key to H2O. New key holders must first hear an orientation lecture and sign a usage agreement form before using the observing site.

_____ Annual access fee ($10). You must also be a key holder to access the site.

Donation (optional):

_____ Tax-deductible contribution to Tri-Valley Stargazers

Total enclosed: $ _____

Member agrees to hold Tri-Valley Stargazers, and any cooperating organizations or landowners, harmless from all claims of liability for any injury or loss sustained at a TVS function. TVS will not share information with anyone except as detailed in our Privacy Policy (http://www.trivalleystargazers.org/privacy.shtml).

Mail this completed form along with a check to: Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551.