PrimeFocus

March 2024

WHEN:

March 15, 2024
Doors open at 7:00pm
Meeting at 7:30pm
Lecture at 8:00pm

WHERE:

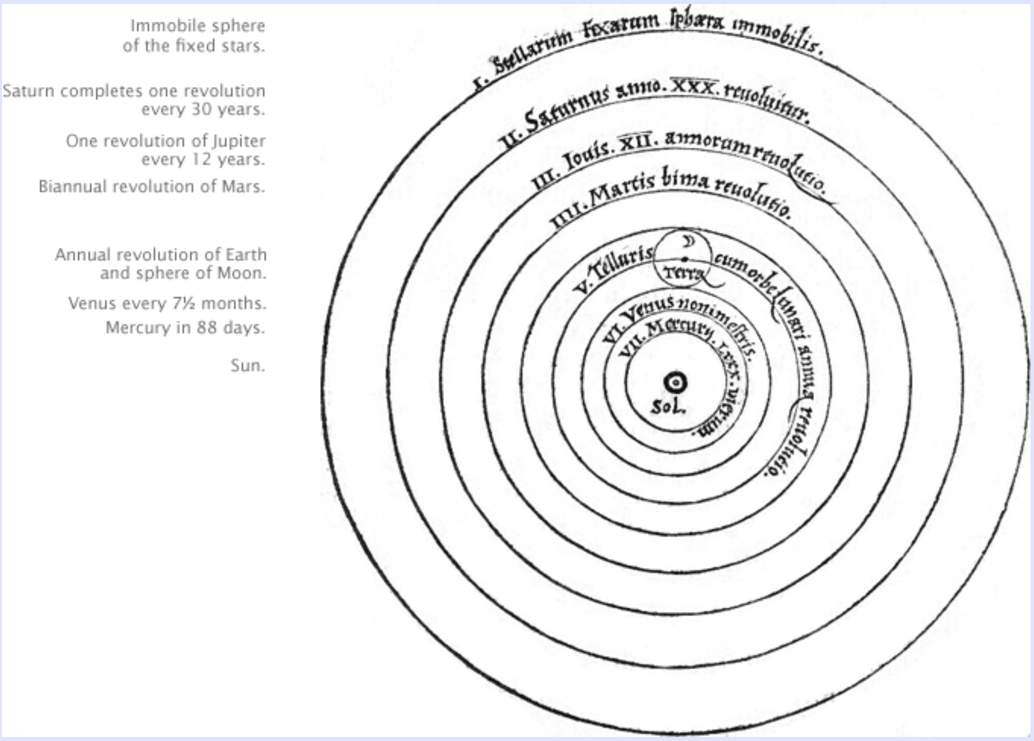
Unitarian Church
1893 North Vasco Rd.
Livermore, CA 94551
and via Zoom

TVS QR CODE

INSIDE THIS ISSUE:

COPERNICAN ASTRONOMY BEFORE COPERNICUS
DON DOSSA

When we think about the development of astronomy the first people that come to mind are frequently Ptolemy, Tycho, Copernicus, Kepler, and finally Galileo. Why do we focus on only these people? How revolutionary were their ideas? The path to get to our modern understanding of the solar system is more involved, sometimes circuitous, and with some spectacular missed opportunities.



In 1543, Nicolaus Copernicus detailed his radical theory of the Universe in which the Earth, along with the other planets, rotated around the Sun. His theory took more than a century to become widely accepted. [Adapted from Nicolaus Copernicus, 1543, De revolutionibus orbium coelestium ("On the Revolutions of the Heavenly Spheres.")]

Don has been a member of TVS for many years and has participated in many of our public outreach events. His PhD is from Worcester Polytechnic Institute on the topic of theoretical semiconductor physics. He has been a corporate computer architect on several CPU designs and implementations and was one of the project leaders on the design of the BlueGene/L system for Lawrence Livermore National Lab which was the fastest computer in the world. His current interest is in planetary imaging and processing, and asteroid tracking. He is learning a lot about it from his son Tom, who is also a member. In the past he gave a talk on his design work on the Large Synoptic Survey Telescope, now called the Vera C. Rubin Observatory.

NEWS AND NOTES

2024 Meeting Dates

Club Meeting	Board Meeting	PrimeFocus Deadline
Mar. 15	Mar. 18	Mar. 1
Apr. 19	Apr. 15	Apr. 5
May. 17	May. 20	May. 4

Money Matters

As of the last Treasurer's Report on 2/19/24, our club's account balance is $53,982.07. This includes $26,146.47 in the H2O Rebuild fund.

TVS Welcomes New Members

TVS welcomes new member Thomas Taylor. Please say hello and chat with him during our meetings.

2024 Club Star Party Schedule

Save the dates for the 2024 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. The public is invited for the first 1.5-2 hours, while club members can stay the remainder of the night.

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 27: Tesla Vintner's Star Party, 5143 Tesla Rd., Livermore. Set-up at 7:30pm, Observing 8:15-Midnight.

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.

May 25: H20 Open House, at 6pm the caravan to H2O PROMPTLY leaves the corner of Mines and Tesla Rds., Livermore. Observing until 11:30pm.

April 13: Solar observing at Tri-Valley Innovation Fair, Alameda County Fairgrounds. Set up 9:00am, observing from 10:00am to 5:00pm, The fair goes from 10 to 5.

CALENDAR OF EVENTS

March 22, 23, 29, 30, April 5, 6, 12, 13, 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/

March 13, 7:00 PM

What	Black Holes and the Technology to Find Them
Who	Silicon Valley Astronomy Lecture Series
Where	Smithwick Theater at Foothill College, in Los Altos - https://foothill.edu/map/
Cost	Free

The population of black holes, objects left over from dead stars, in the Milky Way is almost entirely unexplored. Only about two dozen black holes are confidently known in our Galaxy -- all in "binary systems" where they orbit a living star. As a result, some of the most basic properties of black holes remain unknown, including the true number of black holes in the Galaxy, their masses and sizes, the fraction that is in binary systems, and how these black holes were formed. To understand these properties, we need to find and study a larger population of black holes, both in isolation and in binary systems. Gravitational lensing, something predicted by Einstein's work, is opening a new window onto black holes, and the first free-floating black holes are now being discovered. Astronomers expect that the number of known black holes will increase by a factor of 100 over the next decade.

Jessica Lu received her undergraduate degree in physics from MIT. She was awarded a Millikan Postdoctoral Fellowship in Observational Astronomy at Caltech. She is currently an Associate Professor at UC Berkeley Astronomy Department.

For more information, see:
https://www.seti.org/event/black-holes-and-technology-find-them

April 1, 7:30 PM

What	The Formation of New Worlds and the Building Blocks of Life
Who	California Academy of Sciences
Where	Morrison Planetarium; 55 Music Concourse Drive, San Francisco, CA 94118
Cost	Public: $15; Members and seniors: $12

Featuring Dr. Jenny Bergner, University of California at Berkeley. Astronomers have recently discovered thousands of exoplanets in orbit around other stars. What are these different planets like? Are any hospitable to the development of life? Answering these questions leads us to delve into the rich chemistry that accompanies the formation of new solar systems. Powerful telescopes including JWST are now illuminating, in greater detail than ever before, the distinctive chemistry at play during planet formation. Complementing this, laboratory experiments that mimic the extreme conditions found in space can reveal how molecules behave in these exotic environments. The emerging view of planet formation chemistry is helping to explain the staggering diversity of planet types and compositions that can form—and to predict how newly formed planets can be seeded with the building blocks for life.

For more information, see:
https://www.calacademy.org/events/benjamin-dean-astronomy-lectures/the-formation-of-new-worlds-and-the-building-blocks-of-life

April 13, 7:00 PM

What	Rocks & Ice in the Solar System
Who	Mount Diablo Astronomical Society (MDAS)
Where	Lower Summit parking lot of Mt. Diablo State Park
Cost	The astronomy program is free; there is a state park entry fee per vehicle.

Comets, meteors and asteroids: how are they different, how are they related? Help make a comet & hold an ancient rock from space.

For more information, see:
https://mdas.net/publicprogram/2024MDASPublicPrograms.pdf

OFFICERS AND VOLUNTEER POSITIONS

Officers

President
Ron Kane
president@trivalleystargazers.org

Vice-President
Eric Dueltgen
vice_president@trivalleystargazers.org

Treasurer
John Forrest
treasurer@trivalleystargazers.org

Secretary
David Lackey
secretary@trivalleystargazers.org

Past President
Roland Albers
past_president@trivalleystargazers.org

Volunteer Positions

Astronomical League Rep.
Don Dossa
alrep@trivalleystargazers.org

Club Star Party Coordinator
Eric Dueltgen
coordinator@trivalleystargazers.org

Del Valle Coordinator
David Wright
delvalle@trivalleystargazers.org

Historian
OPEN
historian@trivalleystargazers.org

Librarian
Ron Kane
librarian@trivalleystargazers.org

Loaner Scope Manager
Ron Kane
telescopes@trivalleystargazers.org

Newsletter
Scott Schneider (Editor)
Saanika Kulkarni (Contributing Editor)
newsletter@trivalleystargazers.org

Webmaster
Swaroop Shere
webmaster@trivalleystargazers.org

Night Sky Network Rep.
Ross Gaunt
nnsn@trivalleystargazers.org

H2O Observatory Director / Rebuild Chairman
Chuck Grant
H20@trivalleystargazers.org

Observing Program Coordinator
Ron Kane
awards@trivalleystargazers.org

Outreach Coordinator
Eric Dueltgen
outreach@trivalleystargazers.org

Potluck Coordinator
OPEN
potluck@trivalleystargazers.org

Program Coordinator
Dan Helmer
programs@trivalleystargazers.org

Publicity and Fundraising
OPEN
publicity@trivalleystargazers.org

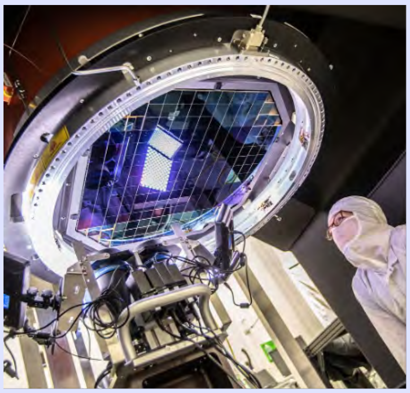
Refreshment Coordinator
OPEN

Web and Email
www.trivalleystargazers.org
info@trivalleystargazers.org

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.

THE ALGORITHMIC ASTRONOMER: AUTOMATING DISCOVERY IN THE COSMOS; SAANIKA KULKARNI

Imagine a lone astronomer, bundled against the chill of a night sky, meticulously recording observations through a telescope. This is the romantic image that often comes to mind when we think of astronomy. But the field is undergoing a dramatic transformation, driven by a modern-day deluge of data.



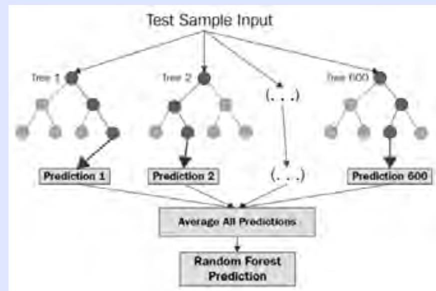
Rubin's 3.2 gigapixel camera. Credit: BBC

Large-scale projects like the Large Synoptic Sky Survey are capturing the universe in unprecedented detail. A few articles back, we discussed the mind-boggling capabilities of the Vera C. Rubin Observatory, with its colossal 3.2-gigapixel camera. These telescopes are amassing datasets that would have been unimaginable a generation ago, and traditional analysis methods are simply overwhelmed.

This is where machine learning enters the picture. By harnessing the power of artificial intelligence, astronomers are gaining a powerful new tool to sift through this cosmic data ocean. Machine learning algorithms can not only automate tedious tasks but also uncover hidden patterns and insights that might escape the human eye. ML algorithms can automate tasks like classifying galaxies, identifying potential exoplanets, and sifting through light curves for transient phenomena like supernovae. This frees up astronomers to focus on deeper analysis and discovery.

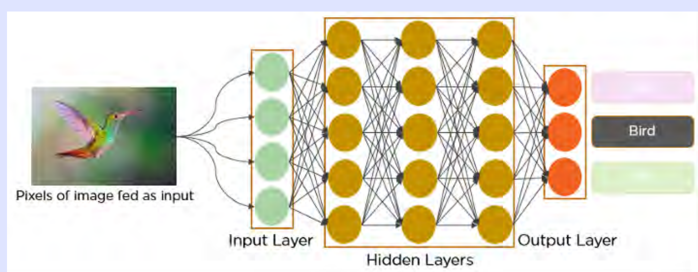
The Algorithmic Toolkit: Tools for Astronomical Discovery

In ML, there are a lot of algorithms that can be used for various tasks. Two basic categories of algorithms are supervised and unsupervised learning. Supervised learning (think data with preset labels) algorithms like Support Vector Machines (SVMs) are already adept at classifying galaxies based on features like shape and color. These algorithms are trained on datasets where galaxies have already been labeled (e.g., spiral, elliptical), allowing the SVM to learn the key features that distinguish different types. Similarly, Random Forests, which combine multiple decision trees, can make highly accurate classifications of galaxies or flag potential exoplanet candidates based on subtle dips in a star's brightness.



Supervised learning can take training data with preset labels and learn the types of labels to then apply to data that needs classification. Image credit: TensorFlow ML Projects

Unsupervised learning algorithms also play a crucial role. When data isn't neatly categorized, these algorithms can uncover hidden structures within vast datasets, revealing the underlying order in the cosmos. For instance, K-Means Clustering groups galaxies with similar characteristics together, perhaps uncovering a previously unknown cluster of young galaxies in a distant corner of the universe. Principal Component Analysis (PCA) takes a different approach. It identifies the most significant variations within a dataset, allowing astronomers to focus on the most relevant features when analyzing complex data from space telescopes.



This is a simplified version of how convolutional neural networks (CNNs) work. Image credit: Analytics Vidhya

More advanced ML techniques can be used as well. Machine learning can accelerate the detection of rare and transient phenomena like supernovae. For instance, convolutional neural networks (CNNs), a type of deep learning algorithm inspired by the structure of the brain, excel at analyzing astronomical images. Trained on data containing supernovae, a CNN could scan through telescope observations in real time, identifying faint

Continues to page 5;

The Algorithmic Astronomer continued;

flashes that might signify a distant stellar explosion. This allows for faster response and coordination between telescopes around the globe, maximizing the scientific return from such fleeting events.

How ML is being used in astrophysics today
Astronomers recently discovered the fastest-growing black hole ever observed, a behemoth nicknamed J0529-4351. This monster, a staggering 17 billion times the mass of our Sun, devours a Sun's worth of material every day, making it the brightest object ever detected in the cosmos. But remarkably, this record-breaker was hiding in plain sight for decades.

Here's where machine learning comes in. Sifting through vast datasets from large-scale surveys is crucial for identifying quasars, the brilliant beacons powered by supermassive black holes. However, these automated tools, while powerful, have limitations. Machine learning algorithms are trained on existing data, which can bias them towards finding objects similar to what's already known. J0529-4351, being far more luminous than any previously observed quasar, simply didn't fit the profile. In fact, an analysis of data from the European Space Agency's Gaia satellite initially categorized it as a nearby star, not a distant quasar.

This highlights the importance of human expertise alongside machine intelligence. While machine learning can be a powerful tool for identifying celestial objects, it's astronomers who ultimately uncover the true nature of these cosmic oddities. In this case, traditional observations with telescopes were needed to confirm J0529-4351 as a record-breaking quasar.

This discovery opens exciting avenues for future research. Studying this monster black hole can shed light on the early Universe and how these behemoths evolve alongside their host galaxies. The next generation of telescopes, like the ESO's Extremely Large Telescope, will also be instrumental in identifying and characterizing these elusive giants, pushing the boundaries of our understanding of the cosmos.

TVS ASTROPHOTOGRAPHY

IC1318 Sadr Region: Left wing of the Butterfly, by Tri Do

19 hr 50 min total integration time. This is an SHO image of the left wing of the butterfly nebula. At the heart of constellation Dajājah lies the bright star Sadr, Arabic for the "chest" of the Hen. The Greeks named the constellation Cygnus the Swan, and the supergiant star is also called Gamma Cygni - the third brightest star, after the third Greek letter of the alphabet, gamma. Just 1800 light years from earth, the light emanating from the star and in the images you see began its journey when the first Mayan temples were being built. Tri received a top pick nomination for this image on Astrobin. Tri will be discussing processing images prior to stretching them during the March 2024 TVS club meeting.
For a full resolution image see https://www.astrobin.com/452ryi/B/

M81 / M82, 10” F4 Newton TSCC UV/IR cut filter, Mosaic 53x & 48x 5min. (8:25hr), ASI2600MC Pro, 1x1 0C, Feb. 2024, (c) Gert Gottschalk

M81 and M82, by Gert Gottschalk, TVS

On Feb. 10 2024 we had a very nice break in the weather between winter rain storms. All of Saturday and the night to Sunday was clear blue skies and observers Gert Gottschalk, John Barclay and Jim NN were at the TVS observing site. The Sun set early and in the west the very thin crescent Moon was visible next to the planet Saturn during evening twilight. Once it got dark the above image of the galaxy pair M81 and M82 was taken by Gert Gottschalk (TVS). The two galaxies form a small group meaning that they are gravitationally bound. A similar situation like the Milky Way and the Andromeda galaxy. Messier 81 (NGC3031 or Bode's Galaxy) is about 12million light-years distant. It was discovered in 1774 by J.E. Bode and added to the catalog of nebulous object by Charles Messier ind 1779. Next is Messier 82 (NGC3034) at the same distance of 12million light-years. It is a little bit smaller than M81. Astronomers believe that M82 underwent a gravitational disturbance caused by M81 about 200million years ago that triggered an outburst of star formation. We can see that in the form of red glowing hydrogen gas filaments that we can see in the image.

The image was taken as a 2 panel mosaic of separate 53 exposures of 5min (4:25hr) of M81 and 48 exposures of 5min (4:00hr) of M82. The images were stacked and merged to a mosaic and then processed together in PixInsight. The scope used was 10inch F4 Newtonian with an ASI2600MC APS-C size 26MPixel CMOS camera. Image & processing by Gert Gottschalk.

See more of Gert’s photography work : https://www.trivalleystargazers.org/gert/Astro_en.htm

H2O Sunset: Thin crescent moon visible next to the planet Saturn, by Gert Gottschalk, TVS
See caption of M81 and M82 above.

WHATS UP

Adapted from Sky & Telescope

All times are Pacific Standard Time

March 2024

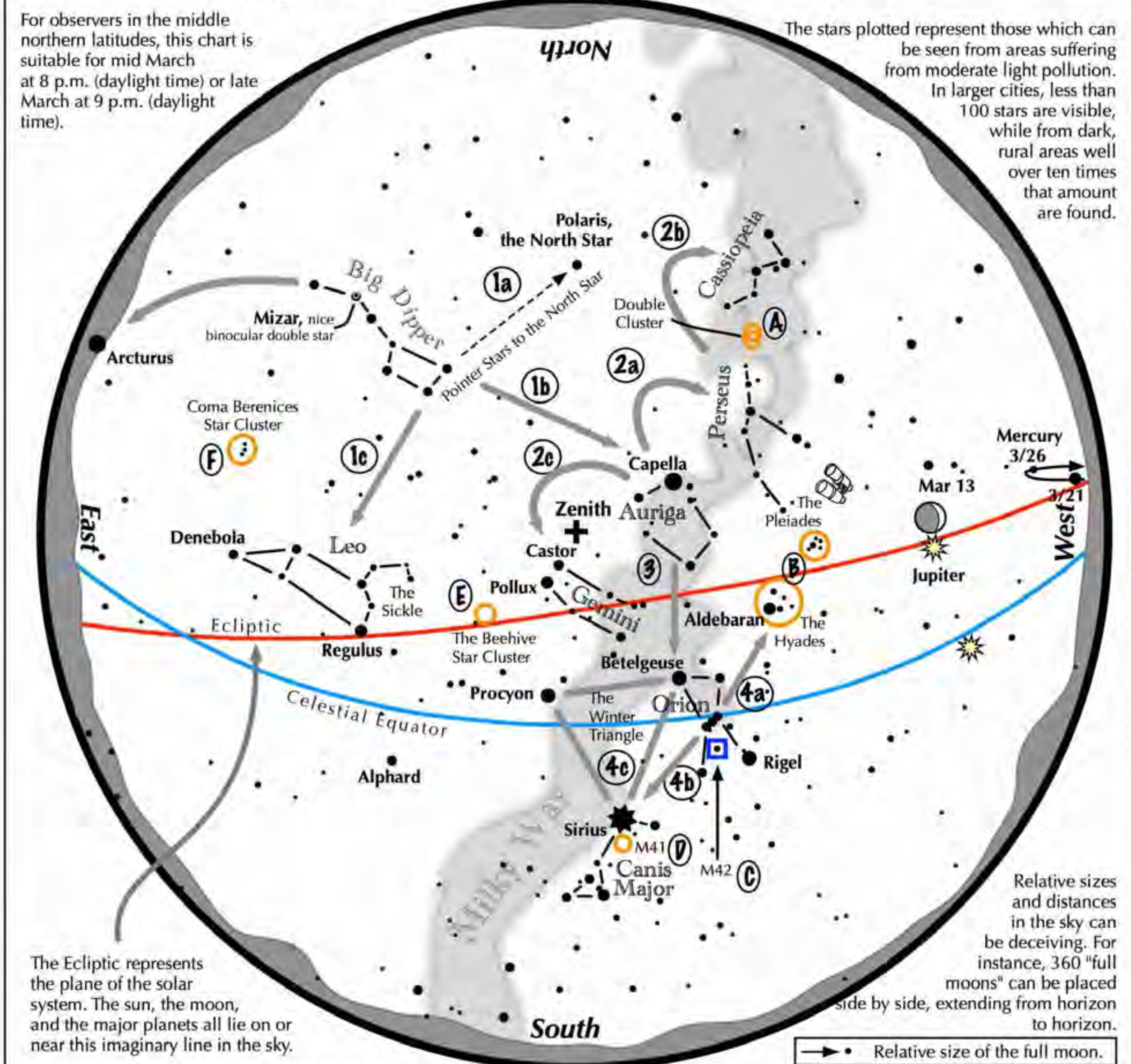
17	Sun	Moon at first quarter
18	Mon	Waxing gibbous moon at dusk is in Gemini less the 3° from Pollux
19	Tue	Spring begins at 8:06pm
21	Thu	Waxing evening moon is 3.5° above Regulus Leo's brightest star in the southeastern sky
25	**Mon**	**Full Moon**
27	Wed	Look for the soft glow of the zodiacal light visible above the western horizon after sunset, best viewed from a dark location
30	Sun	In the morning the wanning moon leads Antares by about 4° as they rise above the southeast horizon

April 2024

2	Tue	Moon at last quarter
6	Sat	Before sunrise watch the moon , Mars, and Saturn rise. Mars will lead the group followed by Saturn and then the moon
8	**Mon**	**New Moon and the Grand North American Solar Eclipse –** The moon's shadow will sweep across northern Mexico and across the US into Canada
10	Wed	Mars and Saturn climb in the east-southeast separated only by 0.5°
11	Thu	Moon is about 6° to the upper left of the Pleiades
14	Sun	Moon gleaming just 6° below Pollux forms a triangle with Gemini's brightest stars Pollux and Castor
15	Mon	Moon at first quarter

NAVIGATING THE NIGHT SKY FOR MARCH

Navigating the mid to late March Night Sky



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/2024/02/2024-March.pdf

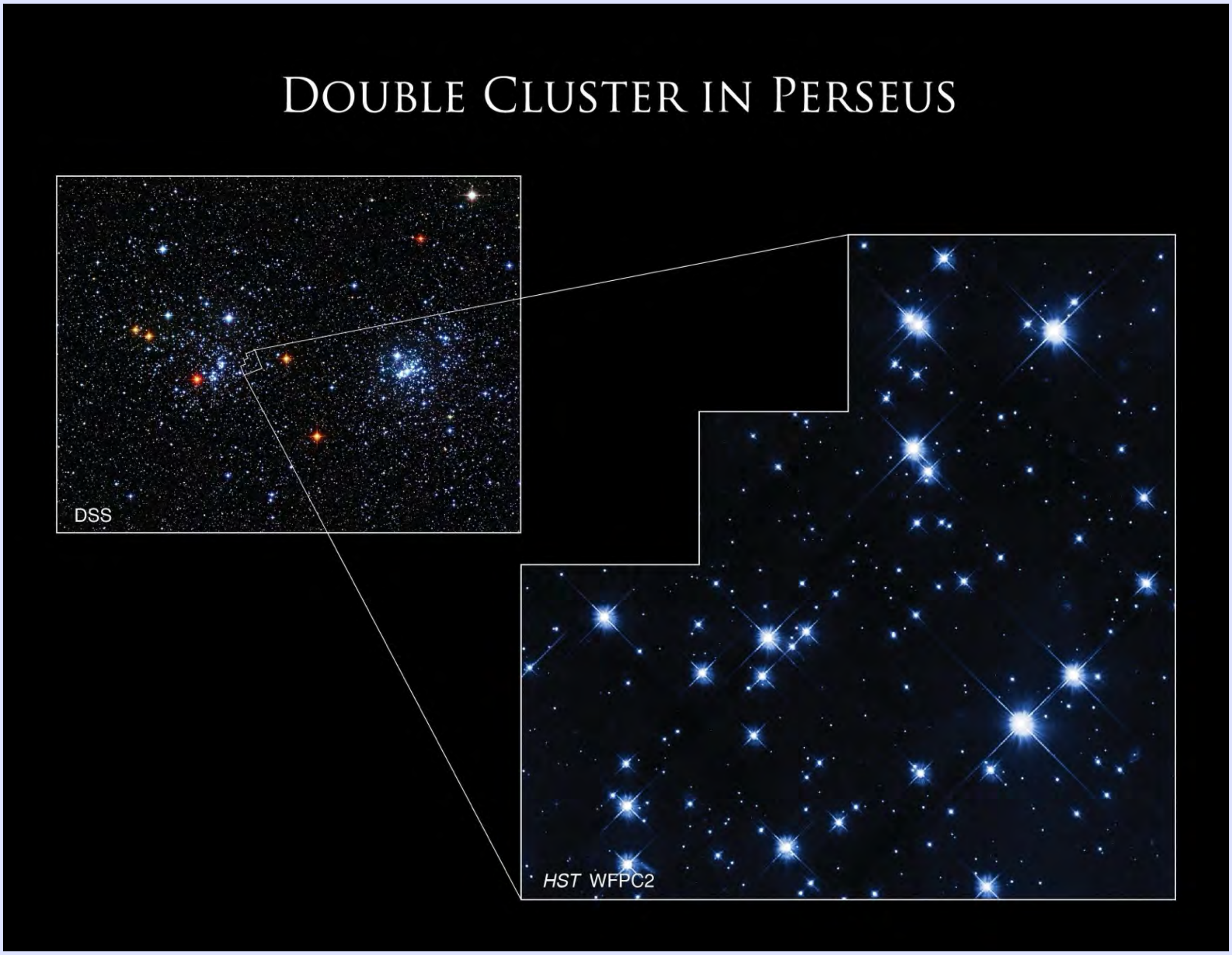
NASA NIGHT SKY NOTES

Constant Companions: Circumpolar Constellations, Part II
By Kat Troche

As the seasons shift from Winter to Spring, heralding in the promise of warmer weather here in the northern hemisphere, our circumpolar constellations remain the same. Depending on your latitude, you will be able to see up to nine circumpolar constellations. This month, we'll focus on: Lynx, Camelopardalis, and Perseus. The objects within these constellations can all be spotted with a pair of binoculars or a small to medium-sized telescope, depending on your Bortle scale – the darkness of your night skies.

In the appearance of left to right: constellations Perseus, Camelopardalis, and Lynx in the night sky. Also featured: Cassiopeia as a guide constellation, and various guide stars.
Credit: Stellarium Web

- Double Stars: The area that comprises the constellation Lynx is famous for its multiple star systems, all of which can be separated with a telescope under dark skies. Some of the notable stars in Lynx are the following:
    - 12 Lyncis – a triple star that can be resolved with a medium-sized telescope.
    - 10 Ursae Majoris – a double star that was once a part of Ursa Major.
    - 38 Lyncis – a double star that is described as blue-white and lilac. The Owl Cluster: Located in the 'W' or 'M' shaped constellation Cassiopeia, is the open star cluster known as the Owl Cluster. Sometimes referred to as the E.T. Cluster or Dragonfly Cluster, this group of stars never sets below the horizon and can be spotted with binoculars or a small telescope.
- Kemble's Cascade: This asterism located in Camelopardalis, has over 20 stars, ranging in visible magnitude (brightness) and temperature. The stars give the appearance of flowing in a straight line leading to the Jolly Roger Cluster (NGC 1502). On the opposite side of this constellation, you find the asterism Kemble's Kite. All three objects can be spotted with a pair of binoculars or a telescope and require moderate dark skies.



A ground-based image from the Digitized Sky Survey (DSS) in the upper left shows Caldwell 14, the Double Cluster in Perseus, with an outline of the region imaged by Hubble's Wide Field and Planetary Camera 2 (WFPC2). Ground-based image: Digitized Sky Survey (DSS); Hubble image: NASA, ESA, and S. Casertano (Space Telescope ScienceInstitute); Processing: Gladys Kober (NASA/Catholic University of America)

- Double Cluster: The constellation Perseus contains the beautiful Double Cluster, two open star clusters (NGC 869 and 884) approximately 7,500 light-years from Earth. This object can be spotted with a small telescope or binoculars and is photographed by amateur and professional photographers alike. It can even be seen with the naked eye in very dark skies. Also in Perseus lies Algol, the Demon Star. Algol is a triple-star system that contains an eclipsing binary, meaning two of its three stars constantly orbit each other. Because of this orbit, you can watch the brightness dim every two days, 20 hours, 49 minutes – for 10-hour periods at a time. For a visual representation of this, revisit NASA's What's Up: November 2019.

From constellations you can see all year to a once in a lifetime event! Up next, find out how you can partner with NASA volunteers for the April 8, 2024, total solar eclipse with our upcoming mid-month article on the Night Sky Network page through NASA's website!

ADDITIONAL LINKS:
https://science.nasa.gov/solar-system/skywatching/how-to-find-good-places-to-stargaze/
https://science.nasa.gov/solar-system/skywatching/what-are-asterisms/
https://www.youtube.com/watch?feature=shared&t=94&v=4mSETiiOpeg

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.