

PrimeFocus



WHEN:

March 18, 2022
Meeting at 7:30pm
Lecture at 8:00pm

WHERE:

Virtual Meeting using Zoom
See the April 2020 issue of
PrimeFocus for info on
getting connected using
Zoom

TVS QR Code



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Tuning into Dark Matter with the ADMX Experiment Dr. Gianpaolo Carosi, Lawrence Livermore National Laboratory

The nature of dark matter is one of the great mysteries of modern physics and could be sourced from new particles beyond the standard model. The Axion, a particle postulated to solve other mysteries in nuclear physics, is one especially well-motivated candidate. These particles, which act more like radio waves, are extraordinarily challenging to detect. The Axion Dark Matter Experiment (ADMX), based at the University of Washington in Seattle, is the flagship search for axion dark matter in the US. ADMX uses a large microwave cavity immersed in a strong static magnetic field to resonantly convert dark matter axions to detectable photons. Recently ADMX has completed several world leading searches with unprecedented sensitivity using superconducting quantum amplifiers. In this talk I will describe the history of axion dark matter searches, describe the recent ADMX results and near-term search prospects and give a survey of the R&D efforts currently underway to explore the entire axion dark matter mass window.



Caption: The 8.5 Tesla ADMX magnet being installed at the University of Washington, Seattle (https://en.wikipedia.org/wiki/Axion_Dark_Matter_Experiment#/media/File:ADMX_magnet_installation.jpg). This file is licensed under the [Creative Commons Attribution-Share Alike 3.0 Unported](https://creativecommons.org/licenses/by-sa/3.0/) license.

Gianpaolo (GP) Carosi is a staff physicist at Lawrence Livermore National Laboratory (LLNL) and is the current co-spokesperson for the ADMX collaboration. GP pursued his bachelor's degree at Harvey Mudd College where he had the privilege of working on the Keck Telescopes. After a brief research stint at JPL he moved to MIT and worked on the Alpha Magnetic Spectrometer (AMS), a cosmic ray telescope now installed on the ISS, for his Ph.D. In 2006 he moved to LLNL as a postdoc to work on an earlier version of the ADMX experiment and has been enamored with upgrading it ever since.

News and Notes

2022 Meeting Dates

Lecture Meeting	Board Meeting	PrimeFocus Deadline
Mar. 18	Mar. 21	
Apr. 15	Apr. 18	Apr. 1
May 20	May 23	May 6
Jun. 17	Jun. 20	Jun. 3
Jul. 15	Jul. 18	Jul. 1
Aug. 19	Aug. 22	Aug. 5
Sep. 16	Sep. 19	Sep. 2
Oct. 21	Oct. 24	Oct. 7
Nov. 18	Nov. 21	Nov. 4
Dec. 16	Dec. 19	Dec. 2

Money Matters

As of the last Treasurer's Report on 02/21/22, our club's account balance is \$66,277.69. This includes \$43,107.14 in the H2O Rebuild fund.

TVS Welcomes New Members

TVS welcomes new members Oudaya Carounanidy, Rahul Jaiswal, Joseph Koning, Mark Monillas, Aris Pope, and Allan Zhang. Please say hello and chat with them during our Zoom meetings.

Time to Renew Club Membership for 2022

Now is a great time to become part of TVS. Membership is open to anyone with an interest in astronomy. Amateurs and professionals are equally welcome; skilled amateurs comprise the majority of the membership. You do not have to own a telescope in order to be a member.

Those renewing their club membership are encouraged to do so by using the online application before the end of December. Normally our memberships are only good for the calendar year, but anyone joining after October 1st will be given a membership for the remainder of 2021 and all of 2022.

The regular club membership remains a bargain at \$30. Student membership (full-time High School or College student) is only \$10! To become a key holder to H2O, you must be 18 or older. There is a one-time \$20 Key deposit and a \$10 annual access fee.

You can join TVS or renew your membership online at: <http://www.trivalleystargazers.org/membership.shtml> After filling out the application form you are connected to the PayPal payment form. You do not need to have a PayPal account to pay online, since PayPal will accept credit cards. Everyone is encouraged to use the online application. Alternatively, you can mail in the Membership Application on the last page of this newsletter along with a check to the Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551-2476. Note that TVS will not share your information with anyone. We only use the e-mail address to notify you when the newsletter becomes available.

All members agree to hold the 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

2022 Club Star Party Schedule

Save the dates for the 2022 Club Star Parties.

March 19, 9am-5pm: Solar observing at the Alameda County Fairgrounds, Pleasanton; Solar scopes needed

April 2, 7-9:30pm: Outreach party at the Muslim Community Center, 5725 W. Las Positas Blvd., Pleasanton

April 8, 7:30-9:30pm: Outreach party at the Sebastian Questa Elementary School, 685 N. Montebello St., Mountain House

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.

H2O Open House star parties are open to the public. 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.

Barcroft High Altitude Star Party

Reservations for the Eastbay Astronomical Society's Barcroft High-Altitude Star Party are now open to members of both the EAS and Tri-Valley Stargazer's clubs. This year's event will be held from Saturday, August 27 through Friday, September 2nd (with departure by noon of Friday, September 2nd). That's six nights. Space at Barcroft is limited to a maximum of 12 people per day, so to ensure you get the days you want, make your reservations early.

Before sending payments for reservations (\$65 per night, per person), even if you've been there before, please contact Don Saito FIRST (barcroft@eastbayastro.org) to ensure the dates you wish to attend are available. You will also be asked to read the [Barcroft Writeup](#), as it provides the information you'll need to have a safe, comfortable stay, and what is expected of guests to this University of California research facility.

For more details on making a reservation, see:

<https://eastbayastro.org/events/>

Calendar of Events

March 18, 19, 25, 26, April 1, 2, 7:30pm-10:30pm

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. Our observatory deck offers breathtaking views 1,500 feet above the Bay. 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).

For COVID-19 Restrictions, see:

<https://chabotspace.org/visit/plan-your-visit/>

For more information, see:

<https://chabotspace.org/events/events-listing/>

March 19, 11:00am-4:00pm

What: Investigation Space: Stellar Scientists
Who: Chabot Staff
Where: Chabot Space and Science Center, 10000 Skyline Blvd. Oakland, CA 94619
Cost: General Admission

Scientific Adventures for Girls is teaming up with Chabot Space & Science Center for an out-of-this-world day that brings together hands-on activities and interactive conversations to highlight female scientists and experiences. Engage with big questions in science while meeting women in space exploration, building rockets, dreaming up planets and more!

For more information, see:

<https://chabotspace.org/events/events-listing/>

April 4, 7:30pm

What: The Search for Living Worlds Beyond the Solar System
Who: Professor Victoria Meadows, (University of Washington)
Where: Golden Gate Park, 55 Music Concourse Drive, San Francisco
Cost: Members and Seniors \$12, Guests \$15

One of the grandest and most enduring questions in human history has been whether we are alone in the Universe. While previous generations could only speculate about the possibility of life around other stars, in the coming decades NASA will develop and deploy the telescopes required to begin exploring the environments of distant worlds. But getting these challenging observations alone is not enough - we also need an improved understanding of what we should be looking for, and how we might interpret what we observe. In this talk Dr. Meadows will highlight work being done by her NASA Virtual

continued on p.4

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TVS E-Group

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

TVS Astrophotos: Flaming Star Nebula



Caption: Kai Yung recently imaged the Flaming Star Nebula. He reports: "This is the Flaming Star Nebula in the HSS palette, combined with RGB data for the stars. The narrowband data were taken with my EdgeHD11 with Hyperstar V4 and ASI2600mm-Pro. The RGB data were taken with my Canon EF 300mm f/4 lens with ASI294mc-Pro. Since SII is usually present around the edges of the Ha emission, I used the HSS palette to highlight that and arrive at the crashing wave effect. White in this picture implies presence of both Ha and SII, while red indicates the region mainly of Ha. The RGB data is from 60 second exposures for 2 hours at gain 120 and -10 C, and the SII and Ha are each 4 minute exposures x 30 at gain 200 at -10 C."

Calendar of Events (con't)

Planetary Laboratory team to guide this search - including understanding the factors that lead to a planet being able to support life, and how we might recognize and assess signs of alien life on a distant world. She will also provide an overview of current and upcoming NASA space telescopes, and discuss their potential for exploring living worlds beyond our Solar System.

For more information, see:

<https://www.calacademy.org/events/benjamin-dean-astronomy-lectures/the-search-for-living-worlds-beyond-the-solar-system>

Citizen Group Takes Action to Improve Air Quality in the Tri-Valley

Ron Baskett, Chair, Tri-Valley Air Quality Community Alliance (TVAQCA, tvaqca1@gmail.com)

For decades, Livermore has recorded some of the highest smog concentrations in the Bay Area. The Bay Area Air Quality Management District (BAAQMD) has reduced emissions and our air quality has improved. **However, one in five of the days each year our Air Quality Index (AQI) still reaches 50 or higher—unhealthy for sensitive populations.** On these days over 100,000 Tri-Valley residents—those with respiratory problems, young children, pregnant women, and elderly—can be negatively impacted.

Stargazing also depends on good air quality! When we look at the sky, we usually think of visibility--visual range depends on many variables both natural and man-made. Higher ozone concentrations result in whitish horizons (see photos from Pleasanton Ridge to the east). Particulates, especially those in the PM2.5 range, reduce visual range and cause red sunsets. Large-scale weather patterns are the primary factor which determine horizontal visual range as well as the vertical optical density.



Haze on Sept. 30, 2020, a high ozone day

Clear air on Dec. 23, 2020

To engage our community and go the last mile to continue improving our air quality, the Air District funded the [Tri-Valley Air Quality Community Alliance \(tvaqca.org\)](http://tvaqca.org) with a [Community Air Protection Program \(Assembly Bill 617\)](#) grant. We address our key air quality issues:

- **Summer ozone, also known as “smog”**
- **Particulate matter (especially the finer particles, PM2.5, that get deep in the lungs and even enter the bloodstream and organs) from diesel trucks**
- **Wildfire smoke episodes, a source of PM2.5, ozone, and other toxic air contaminants**

Our goals are to:

1. Evolve understanding of Tri-Valley emissions, air quality issues, and health effects.
2. Communicate air quality issues to and obtain feedback from the Tri-Valley Community.
3. Inform local agency decisions that involve air quality.
4. Reduce emissions in the Tri-Valley with a focus on funding local landscaping companies to replace gas-powered equipment with electric.
5. Increase awareness and scientific knowledge of our student population.
6. Assist low-income residents to improve their home air filtration and reduce indoor health effects wildfire smoke events

To reduce our ozone now, TVAQCA launched an [incentive program](#) which funds landscape companies to purchase of electric equipment.

For the technical background and details of our project, please see “Our Reports” on our [web page](#). We are currently expanding our group of volunteers to assist with outreach and educational activities. If you would like to assist spreading our message to the Tri-Valley community, please email us at tvaqca1@gmail.com.

Also, we would appreciate your perspective on our air quality--please take our online survey at [Tri-Valley Air Quality Community Alliance 3Q2021 Survey](#).

On the educational front, we are collaborating with [Quest Science Center](#) on joint weather-air quality-climate projects. We are also offering part-time paid internships for special studies ... one such study could be the relation between weather and the clarity of the night sky!

We hope citizen actions will help ensure the long-term continued improvement of our local air quality as the Tri-Valley continues to grow. Please join us in our efforts.

What's Up By Ken Sperber (adapted from S&T)

All times are Pacific Daylight Time

March

- 13 Sun Daylight Savings Time begins at 2:00am**
15 Tue The Moon is 4° to the upper left of Regulus in the southeast (Evening)
18 Fri Full Moon (00:18am)
19 Sat The Moon and Spica, separated by 4° , rise in tandem in east-southeast (Evening)
23 Wed The Moon is 2° above of Antares in the south (Dawn)
24 Thu Last-Quarter Moon (10:37pm)
25 Fri Venus, Mars, and Saturn form a triangle and rise in the east-southeast (Dawn)
26 Sat Algol at minimum brightness for 2 hours centered on 8:51pm
28 Mon The crescent Moon, Venus, Mars, and Saturn rise in the east-southeast (Dawn)
29 Tue Algol at minimum brightness for 2 hours centered on 8:41pm
31 Thu New Moon (11:24pm)

April

- 1 Fri Venus, Saturn, and Mars climb in the east-southeast (Dawn)
4 Mon Saturn and Mars, separated by 0.5° , climb in the east-southeast (Dawn; see April S&T, p.46)
4 Mon View the thin crescent Moon, in Taurus, about 4° from The Pleiades (Evening)
8 Fri First-Quarter Moon (11:48pm)
8 Fri The Moon, Castor, and Pollux form an isosceles triangle in Gemini (Evening)
9 Sat The Moon is 5° left of Pollux in Gemini (Evening)
16 Sat Jupiter, Venus, Mars, and Saturn adorn the east-southeast (Dawn)
16 Sat Full Moon (11:55am)
19 Tue The Moon, in Scorpius, is 6° to the right of Antares (Morning)
22 Fri The Lyrid meteor shower peaks (Morning)
23 Sat Last-Quarter Moon (4:56am)
25 Mon The Moon, Saturn, and Mars form a triangle, with Venus and Jupiter lower in the east (Dawn)
26 Tue The Moon is nearly midway between Venus and Mars (Dawn)
27 Wed The Moon forms a triangle with Jupiter and Venus low in the east (Dawn)
29 Fri Mercury is to the lower left of The Pleiades, very low in the west-northwest (Dusk)
30 Sat Jupiter and Venus, separated by 0.5° , rise in the east (Dawn)
30 Sat New Moon (1:28pm)

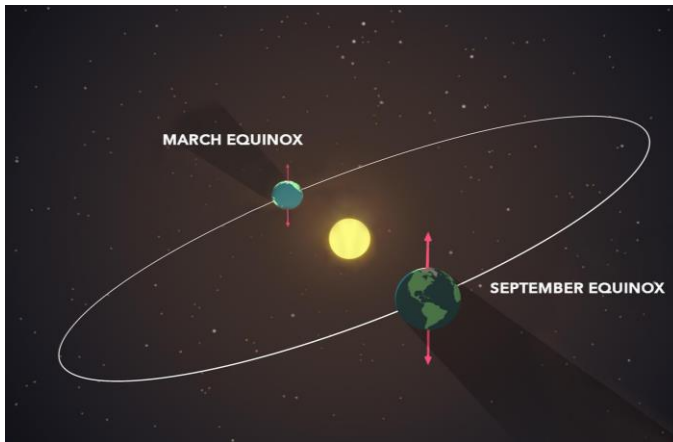


Embracing the Equinox

By David Prosper

Depending on your locale, equinoxes can be seen as harbingers of longer nights and gloomy weather, or promising beacons of nicer temperatures and more sunlight. Observing and predicting equinoxes is one of the earliest skills in humanity's astronomical toolkit. Many ancient observatories around the world observed equinoxes along with the more pronounced solstices. These days, you don't need your own observatory to know when an equinox occurs, since you'll see it marked on your calendar twice a year! The word "equinox" originates from Latin, and translates to equal (equi-) night (-nox). But what exactly is an equinox?

An equinox occurs twice every year, in March and September. In 2022, the equinoxes will occur on March 20, at exactly 15:33 UTC (or 11:33 am EDT), and again on September 23, at 01:04 UTC (or September 22 at 9:04 pm EDT). The equinox marks the exact moment when the center of the Sun crosses the plane of our planet's equator. The day of an equinox, observers at the equator will see the Sun directly overhead at noon. After the March equinox, observers anywhere on Earth will see the Sun's path in the sky continue its movement further north every day until the June solstice, after which it begins traveling south. The Sun crosses the equatorial plane again during the September equinox, and continues traveling south until the December solstice, when it heads back north once again. This movement is why some refer to the March equinox as the northward equinox, and the September equinox as the southward equinox.

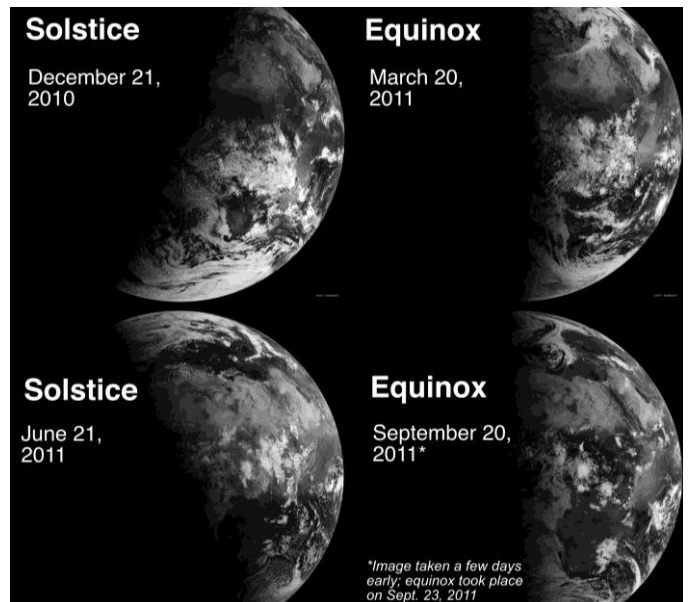


Caption: This (not to scale) image shows how our planet receives equal amounts of sunlight during equinoxes. Credit: NASA/GSFC/Genna Duberstein

Our Sun shines equally on both the Northern and Southern Hemispheres during equinoxes, which is why they are the only times of the year when the Earth's North and South Poles are simultaneously lit by sunlight. Notably, the length of day and night on the equinox aren't precisely equal; the date for that

split depends on your latitude, and may occur a few days earlier or later than the equinox itself. The complicating factors? Our Sun and atmosphere! The Sun itself is a sphere and not a point light source, so its edge is refracted by our atmosphere as it rises and sets, which adds several minutes of light to every day. The Sun doesn't neatly wink on and off at sunrise and sunset like a light bulb, and so there isn't a perfect split of day and night on the equinox - but it's very close.

Equinoxes are associated with the changing seasons. In March, Northern Hemisphere observers welcome the longer, warmer days heralded by their vernal, or spring, equinox, but Southern Hemisphere observers note the shorter days - and longer, cooler nights - signaled by their autumnal, or fall, equinox. Come September, the reverse is true. Discover the reasons for the seasons, and much more, with NASA at nasa.gov



Caption: Scenes of Earth from orbit from season to season, as viewed by EUMETSAT. Notice how the terminator - the line between day and night - touches both the North and South Poles in the equinox images. See how the shadow is lopsided for each solstice, too: sunlight pours over the Northern Hemisphere for the June solstice, while the sunlight dramatically favors the Southern Hemisphere for the December solstice. Source: bit.ly/earthequinox Images: NASA/Robert Simmon

This article is distributed by the NASA Night Sky Network, a coalition of hundreds of astronomy clubs across the US dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, stargazing info 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.