

PRIMEFOCUS

Tri-Valley Stargazers



June 2018



Meeting Info Black Holes and Dark Matter

Who:
Dr. Nathan Golovich

When:
June 15, 2018
Doors open at 7:00 p.m.
Meeting at 7:30 p.m.
Lecture at 8:00 p.m.

Where:
Unitarian Universalist
Church in Livermore
1893 N. Vasco Road

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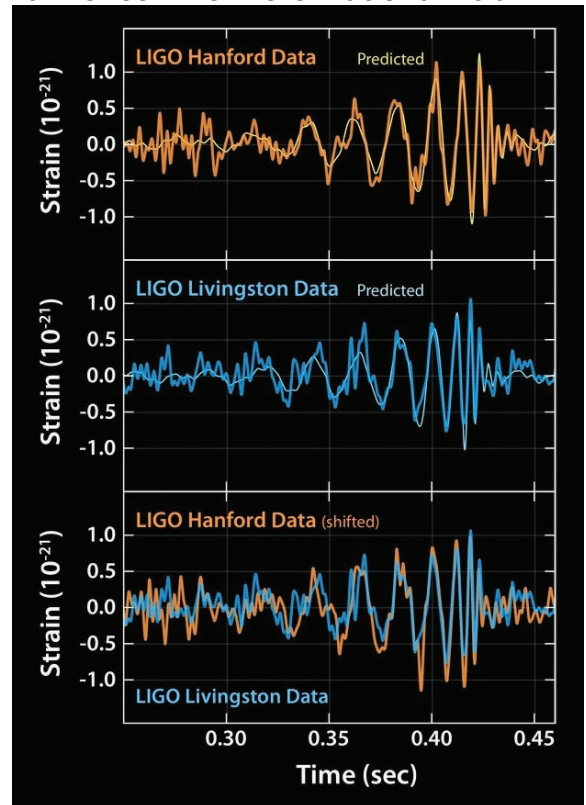
June Meeting

Black Holes as Dark Matter: How New Discoveries Are Reinvigorating Old Theories

Dr. Nathan Golovich - Lawrence Livermore National Lab

Arguably the most important discovery of the twenty first century is that of gravitational waves by LIGO. This has opened the door to a new method of observing the universe. However, it has also opened the door to new and exotic potential solutions of the dark matter problem. In this talk I will discuss the evidence for dark matter, black holes and their origins, how the solution to the dark matter problem could be black holes created in the first second after the Big Bang, and how we are going about looking for them in the Milky Way.

I fell in love with astronomy in the winter of 1996 to 1997 with the views of the comet Hale-Bopp in the dark northern Michigan skies I grew up looking toward. I was just seven years old, but I can easily track my interest back to that time. After high school, I went to the University of Michigan, graduating in 2012 with a degree in engineering physics before going to UC Davis for my PhD in physics, which I completed last September. In graduate school, I was an extra-galactic astronomer studying the dark matter problem through observations of merging galaxy clusters. For my post-doctoral work, I have turned my focus to within the Milky Way in a search for black holes that could offer a new possibility for the dark matter problem. I live in Livermore, and I enjoy hiking, surfing, and photography throughout the Bay Area, California, and beyond.



Caption: GW150914 signal observed by the twin LIGO observatories at Livingston, Louisiana, and Hanford, Washington. The signals came from two merging black holes, each about 30 times the mass of our sun, lying 1.3 billion light-years away.

News & Notes

2018 TVS Meeting Dates

Below are the TVS meeting dates for 2018. The lecture meetings are on the third Friday of the month, with the Board meetings on the Monday following the lecture meeting.

Lecture Meeting	Board Meeting	Prime Focus Deadline
Jun. 15	Jun. 18	
Jul. 20	Jul. 23	Jun. 29
Aug. 17	Aug. 20	Jul. 27
Sep. 21	Sep. 24	Aug. 31
Oct. 19	Oct. 22	Sep. 28
Nov. 16	Nov. 19	Oct. 26
Dec. 21	Dec. 17	Nov. 30

Money Matters

As of the last Treasurer's Report on 05/21/18, our club's checking account balance is \$16604.21.

Outreach Star Parties

Monday, 06/25/18: Outreach star party at the Taylor Family Foundation Camp; 8:00pm

Saturday, 07/21/18: Outreach party at Del Valle Arroyo staging area; 8:15pm

Please contact Eric Duetgen for further information about the Outreach Star Parties.

Club Star Party

Saturday, 06/16/18: TVS club star party at Tesla Winery; 8:00pm. The theme of the party is "Gobs of Globes". We should be able to observe a half dozen or more globular clusters that night, comparing size, brightness, and density. With the addition of recording an estimate of the seeing, transparency, and limiting magnitude your observations can be used in the pursuit of completing The Astronomical League Globular Cluster Observing Program: <https://www.astroleague.org/al/obsclubs/globular/globular1.html>

TVS Baseball Cap Available for Purchase

TVS Baseball Caps are available for purchase at a cost of \$15 each. As seen in the header image on the cover page, the caps are Navy Blue with an embroidered club logo. The size is adjustable with a high quality strap and buckle-no plastic here! Purchase a cap to support the club and amateur astronomy. The cap will easily identify you as a TVS member at club outreach star parties, and they will even keep your head warm. Contact Club Treasurer Roland Albers if you are interested in purchasing a cap.

Calendar of Events

June 4, 7:30pm

What: Are We Alone in the Universe?
Who: Lisa Kaltenegger, Director, Carl Sagan Institute, Cornell University
Where: California Academy of Sciences, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA
Cost: Advanced ticketing required. Academy members \$12, Seniors \$12, General \$15. Reserve a space online or call 1-877-227-1831.

The detection of thousands exoplanets orbiting other alien Suns has revolutionized our view of the cosmos. With the next generation of telescopes we will be able to peer into the atmospheres of rocky planets and get a glimpse into other worlds. In this lecture Dr. Kaltenegger shows the latest results and explores how we can determine which of these exoplanets might be suitable for life. She will discuss techniques and missions that could detect life on these worlds, finally answering the question, "Are we alone in the Universe?"

Lisa Kaltenegger is director of the Carl Sagan Institute at Cornell University and an associate professor in Cornell's astronomy department. Her research focuses on exploring worlds around alien Suns and searching for signs of life. Her awards include the 2014 Doppler Prize for Innovation in Science and the 2012 Heinz Maier-Leibnitz Prize for Physics. She was named an innovator to watch by TIME, a Role Model for Women in Science and Research by the European Commission, and one of America's Young Innovators by Smithsonian Magazine. She is featured in the new IMAX movie "Search for Life in space". Asteroid 7734 Kaltenegger is named after her.

See www.calacademy.org/events/benjamin-dean-astronomy-lectures for lecture and reservation information

June 9, 9:15pm-11:00pm

What: Binocular Stargazing at Coyote Valley Open Space Preserve
Who: San Jose Astronomical Society
Where: Coyote Valley Open Space Preserve, 550 Palm Ave. Morgan Hill, CA
Cost: Free

Binocular Stargazing is hosted by the Santa Clara County Open Space Authority with help from members of the San Jose Astronomical Association.

Want to learn the night sky? Did you know that you don't need to spend a ton of money on a telescope to do so? All you need is a decent pair of binoculars.

Come out and attend the "Binocular Stargazing" event on Saturday June 9th from 9:30 pm to 11 pm at Coyote Valley Open Space Preserve. You will learn all about how the night sky changes by the hour, month, and year. You will learn how

Header Image: TVS Baseball Caps available for purchase. See the article on p.2 of this newsletter. Credit: Roland Albers

Calendar of Events (continued)

to use your binoculars to view asterisms, open and globular clusters, nebulae, and planets.

For this interactive event please bring the following items:

1. 10x42mm binoculars (or larger.) Tripod recommended on binoculars larger than 10x50 (This is a binocular event so please leave telescopes at home)
2. A chair to view in comfort (very important) (lawn chairs are great for this)
3. A red lens flashlight, and warm clothes (extra layers).

Directions: From Highway 101 south or Highway 85 south. Turn right (west) onto Bailey Avenue. At the intersection with Santa Teresa Blvd. turn left. When you get to Palm Ave, turn right. Coyote Valley Open Space Preserve is at the end of the road.

Turn your headlights off as you pull into the first parking lot which is paved. Please park your car there on the paved lot and walk over to gravel lot where the program will be held

Rain or lots of clouds cancels. (Since you can't see anything). Dress warm! See you soon.

For more information see: <https://www.meetup.com/SJ-Astronomy/events/250399962/> and www.sjaa.net/calendar/

June 16, 8:00pm

What: Mission: Mars
Who: Pascal Lee, Mars & SETI Institutes
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

We are making progress globally, from the Arctic to Antarctica, from basement labs to the International Space Station, to achieve the first human voyage to Mars. Come explore the what, why, how, when, and who of our first journey to the Red Planet.

For more information see: <http://www.friendsofmettam.org/astronomy/schedule>

June 25, 7:30pm

What: Piecing Together Mars: From Discovery and Surprise Toward Understanding a Sister World
Who: Carter Emmart (American Museum of Natural History) and Jeff Moore (NASA-Ames Research Center)
Where: California Academy of Sciences, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA
Cost: Advanced ticketing required. Academy members \$12, Seniors \$12, General \$15. Reserve a space online or call 1-877-227-1831.

From ancient times through the telescopic era, the blood red planet Mars puzzled observers with its color, its seasonal features, and its variability—even inspiring the idea that alien engineers shaped its surface! Spacecraft revealed a more sober reality. An ancient cratered surface looked more like the Moon than Earth, colored red as rust, weathered and cut by fluvial channels and giant floods which flowed around the same time that only early bacteria ruled our planet. But Mars possesses some of the most dramatic landscapes in the Solar System with the largest volcanoes and canyons known.

Join us on an authentic visual journey across the surface of Mars—based on real data as transmitted back by our instru-

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TVS E-Group
 To join the TVS e-group just send an e-mail message to the TVS e-mail address (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.

Club Member Astrophoto



Image Caption: Hilary Jones reports: I have finally finished photographing M96. I started this back in February and kept at it until I could get one single night of good seeing. I finished the picture on April 20th. The galaxy was discovered by French astronomer Pierre Méchain on March 20, 1781, and Messier added it to his catalog four days later. This spiral galaxy shows an interesting dust lane spiraling into the nucleus, and it is unusual in the amount of asymmetry in the spiral arms and the distribution of dust and gas. In particular the nucleus is somewhat off-center. There is an edge-on galaxy that lies just behind one of the spiral arms at the 10:00 position in my photograph. That galaxy is five times farther away than M96.

Calendar of Events (continued)

ments there and reconstructed on the dome of Morrison Planetarium. What you'll see is real, in perspectives never before seen on Earth.

See www.calacademy.org/events/benjamin-dean-astronomy-lectures for lecture and reservation information

July 6, 6:00pm-10:00pm

What: \$5 First Fridays

Who: You

Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619

Cost: \$5; <http://www.chabotspace.org/first-fridays.htm>

No details available.

Pre-purchase your tickets for \$5 First Friday at: <http://www.chabotspace.org/first-fridays.htm> or for more information, call (510) 336-7373.

Into the Black: Book Review By Ken Sperber



Image Caption: The launch of Columbia, STS-1 on April 12, 1981 from Pad 39A at Cape Canaveral. Image Credit: NASA.

Simply put, *Into the Black* by Roland White, is the most engaging book I have read about manned space flight since *A Man on the Moon* by Andrew Chaikin. *Into the Black* tells the story of the first Space Shuttle flight, in which Commander John Young and Pilot Bob Crippen put Columbia through her paces during a 3-day mission in 1981. The narrative, presented (more or less) in timeline fashion, takes one through the myriad of critical design aspects of the shuttle while telling the story in the context of the parallel development of the U.S. Air Force Manned Orbiting Laboratory Program, and the black-ops world of the National Reconnaissance Office (NRO), whose mere existence was not publicly revealed until 1992.

Throughout, the book maintains an edge of excitement and trepidation as the story unfolds. Critical to the story is the development of the main engines, whose design problems

led to many an explosion during testing, and the design of the heat shield that protected the shuttle upon reentry to the Earth's atmosphere. In fact, lack of a robust method for attaching the tiles to the orbiter threatened to ground the shuttle after billions of dollars of investment.

California plays a central role in the story, be it North American Rockwell, the manufacturer of the shuttle, Vandenberg Air Force Base, the west coast launch facility for the USAF MOL Program and the shuttle, Edwards Air Force Base, the prime landing site of Columbia, or the Blue Cube in Sunnyvale.

I grew up watching manned launches on TV, with my first recollections being the launch of Gemini missions in the mid-1960's, when I was but 6 years old. With my lifelong interest in the space program I have read more astronaut biographies

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What's Up By Ken Sperber (adapted from S&T and The Year in Space)

All times are Pacific Daylight Time

June

- 1 Fri The waning gibbous Moon is $\sim 3^\circ$ from Saturn in Sagittarius (Early Morning)
- 3 Sun The Moon and Mars are $\sim 3^\circ$ apart in the east-southeast (Early Morning)
- 6 **Wed Last-Quarter Moon (11:32am)**
- 10 Sun Venus, Castor, and Pollux lined up and set in the west (Evening)
- 13 **Wed New Moon (12:43pm)**
- 15 Fri In the northwest, Mercury begins to emerge from the glare of the Sun (Dusk)
- 16 Sat The crescent Moon is $\sim 8^\circ$ from Venus with M44, the Beehive Cluster, halfway between
- 17 Sun The Moon leads Regulus by $\sim 3^\circ$ as they set in the west
- 19-20 Tue- Vesta at opposition, 5.3mag, visible all night
- 20 **Wed First-Quarter Moon (3:51am)**
- 22 Fri The Moon and Jupiter $\sim 4.5^\circ$ apart in Libra
- 27 **Wed Full Moon (9:53pm)**
- 27-28 Wed- Saturn at opposition with rings tilted near maximum extent; with Full Moon only about 1° away!

July

- 3 Tue The Moon and Mars are $\sim 6^\circ$ apart in the southwest (Dawn)
- 3- Tue- Mercury near the western horizon for the next 17 days-use binoculars (Dusk)
- 6 **Fri Last-Quarter Moon (00:51am)**
- 9 Mon Venus and Regulus are $\sim 1^\circ$ apart and set in the west (Early Evening)
- 10 Tue The crescent Moon is \sim one-half degree from Aldebaran as the Hyades rises in the east (Dawn)
- 10 Tue Jupiter stationary, after which it starts moving east against the backdrop of stars
- 11 Wed Mercury at greatest eastern elongation (26°)
- 12 **Thu New Moon (7:48pm)**
- 15 Sun The crescent Moon and Venus are $\sim 2^\circ$, and they trail Regulus by $\sim 5^\circ$ in the west (Dusk)
- 19 **Thu First-Quarter Moon (12:52pm)**

and historical accounts of the space program than I can count. I thought I had a good "picture" of manned spaceflight, but this book challenged some of my understanding and brought much new material to my attention.

Of course, the irony of the book is that it tells the story of how numerous government agencies supported development of the shuttle and provided real-time monitoring of Columbia on her maiden voyage to evaluate the extent of the loss of heat shield tiles and the impact this might have for the safety of the crew. Though not the subject of this book, post-Challenger disaster complacency at NASA, as well as a bureaucratic bungling foiled any such concerted effort in 2003 when while

on ascent the leading edge of the left wing of Columbia was struck by foam that was ripped off of the External Fuel Tank. Of course this story ends badly, with Columbia disintegrating on reentry over central Texas on February 1, 2003. I am presently reading more about this bookend to that tale of Columbia in the book entitled *Comm Check...The Final Flight of the Shuttle Columbia* by Michael Cabbage and William Hardwood.

What Is the Asteroid Belt?

By Linda Hermans-Killiam

There are millions of pieces of rocky material left over from the formation of our solar system. These rocky chunks are called asteroids, and they can be found orbiting our Sun. Most asteroids are found between the orbits of Mars and Jupiter. They orbit the Sun in a doughnut-shaped region of space called the asteroid belt.



Asteroids come in many different sizes—from tiny rocks to giant boulders. Some can even be hundreds of miles across! Asteroids are mostly rocky, but some also have metals inside, such as iron and nickel. Almost all asteroids have irregular shapes. However, very large asteroids can have a rounder shape.

The asteroid belt is about as wide as the distance between Earth and the Sun. It's a big space, so the objects in the asteroid belt aren't very close together. That means there is plenty of room for spacecraft to safely pass through the belt. In fact, NASA has already sent several spacecraft through the asteroid belt!

The total mass of objects in the asteroid belt is only about 4 percent the mass of our Moon. Half of this mass is from the four largest objects in the belt. These objects are named Ceres, Vesta, Pallas and Hygiea.

The dwarf planet Ceres is the largest object in the asteroid belt. However, Ceres is still pretty small. It is only about 587 miles across—only a quarter the diameter of Earth's moon. In 2015, NASA's Dawn mission mapped the surface of Ceres. From Dawn, we learned that the outermost layer of Ceres—called the crust—is made up of a mixture of rock and ice.

The Dawn spacecraft also visited the asteroid Vesta. Vesta is the second largest object in the asteroid belt. It is 329 miles across, and it is the brightest asteroid in the sky. Vesta is covered with light and dark patches, and lava once flowed on its surface.

The asteroid belt is filled with objects from the dawn of our solar system. Asteroids represent the building blocks of planets and moons, and studying them helps us learn about the early solar system.

For more information about asteroids, visit: <https://spaceplace.nasa.gov/asteroid>

This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!

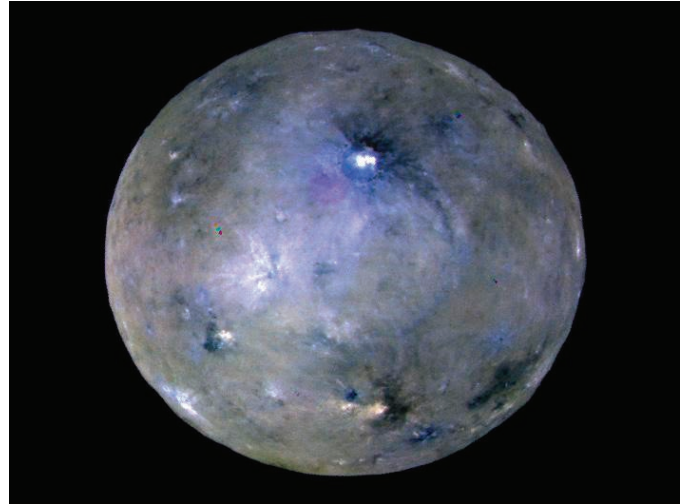


Image Caption: This image captured by the Dawn spacecraft is an enhanced color view of Ceres, the largest object in the asteroid belt. Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA



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 (\$5). Must be a full-time high-school or college student.

Regular member (\$30).

Patron member (\$100). Patron membership grants use of the club's 17.5" reflector at H2O. You must be a member in good standing for at least one year, hold a key to H2O, and receive board approval.

Hidden Hill Observatory Access (optional):

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 (www.trivalleystargazers.org/privacy.shtml).

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