



Vol. 65, No. 8 – August 2017

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***** Lick Observatory Trip – September 9th *****

The SFAA Members-only Lick Observatory trip is planned for Saturday, September 9th. It's a night tour, starting around 5pm and usually lasting for about 4-5 hours, weather depending. If the skies are clear, we might get to look through the Great Lick Telescope. The signups will start in the next week or so. It is for members only. If you have a single membership - only the member can come. If you have a family membership, the member plus one guest can come. There are 40 spots, and it's free. The drive up from San Jose is a twisty and curvy road, which really does take an hour to travel. More detail will follow when signups are opened.

01.

SFAA PRESIDENT'S NOTE | THE GREAT AMERICAN ECLIPSE: SAFETY FIRST!

Yesterday my wife and I visited the Lower Falls of the Grand Canyon Yellowstone River in Yellowstone National Park and today we will visit Old Faithfull. While stopping at several visitor centers, it was easy to notice information, as well as things to buy, on the upcoming eclipse. This time of year Yellowstone is at its peak of the tourist season and no doubt there will be many people in this area and throughout the country (millions) who will observe the eclipse. While looking at the available eclipse information and viewing glasses for sale, I immediately thought of eclipse viewing safety for all the tourists throughout the Park. I hope the Park Rangers emphasize safe viewing, but they also have their hands full managing an enormous Park with herds of Bison and other wildlife, keeping people and wildlife at a safe distance from each other.

As members of the SFAA I trust all of us will observe this great event safely. I also hope that, wherever we are, while viewing the event and being among people who are not necessarily educated about the dangers to eyesight, we take the time to help educate about safe viewing including proper eye protection or other methods of indirect observation. Our knowledge gives us some responsibility to help others experience this glorious celestial event safely as well as provide simple explanations as to what is occurring and why. This is truly one event that millions of people will experience that may excite an interest in astronomy.

So, **Safety First!** should be our thought for this event and with safe viewing the wonders of our Sun and Moon will be experienced and remembered for a lifetime.

Dark, clear and stable skies,

Michael Patrick
President, SFAA

SFAA Board Officers and Directors:

President	Michael Patrick	president@sfaa-astronomy.org
Vice President	Liz Triggs	vice-president@sfaa-astronomy.org
Treasurer	Michael Patrick	treasurer@sfaa-astronomy.org
Secretary	Anthony Barreiro	secretary@sfaa-astronomy.org
Directors:	PJ Cabrera, Anil Chopra, Brian Kruse, Matthew Jones, Jessica Miller, Scott Miller, Douglas Smith, Paul Salazar	

***** Mark Your Calendars *****

Quarterly in-person SFAA Board Meetings – all SFAA members are welcome to attend:

Tuesday August 8, 7:00 pm – 8:45 pm

SF Public Library: Presidio Branch Meeting Room / 3150 Sacramento Street, San Francisco

Tuesday November 14, 7:00 pm – 8:45 pm

SF Public Library: Presidio Branch Meeting Room / 3150 Sacramento Street, San Francisco

Come join us to learn what's going on with upcoming club events such as: public outreach, star viewing trips, scientific lectures, telescope making, members-only dark sky viewing nights, opportunities to participate in Astronomy, and much more.

02. ASTRONOMY EVENTS



SAN FRANCISCO AMATEUR ASTRONOMERS EVENTS AUGUST 1, 2017 – SEPTEMBER 28, 2017

Details at: <http://www.sfaa-astronomy.org>

Tuesday August 8, 7:00 pm – 8:45 pm

SF Public Library: Presidio Branch Meeting Room / 3150 Sacramento Street, San Francisco
Quarterly in-person SFAA Board Meeting – All SFAA Members are welcome to attend

Saturday August 12, 7:30 pm – 11:00 pm

City Star Party, Point Lobos

Saturday August 12, 7:30 pm – 11:00 pm

Perseid Meteor Shower viewing on Mt. Tam - exclusive for members of SFAA and Friends of Mt. Tam

Tuesday August 15, 7:30 pm – 9:15 pm

Meeting and Lecture, Presidio Officers Club

Saturday August 19, 6:30 pm – 2:00 am

Mt. Tam Members Night

Monday August 21, TOTAL SOLAR ECLIPSE, w/ viewing times by NASA for selected viewing sites:

** TOTAL ** Eclipse Path:

- Madras, OR–Eclipse begins 9:06am; ends 11:41am/ **Totality** begins 10:19am; ends 10:21am **PDT**
- Casper, WY–Eclipse begins 10:22am; ends 1:09pm/ **Totality** begins 11:42am; ends 11:45am **MDT**

** PARTIAL ** Eclipse Path:

- San Francisco, CA–Eclipse begins 9:01am; ends 11:37am/ **MAX** partial eclipse view 10:15am **PDT**

Saturday August 26, 7:00 pm – 11:00 pm

Mt. Tam Public Astronomy Night

Saturday September 16, 6:30 pm – 2:00 am

Mt. Tam Members Night

Tuesday September 19, 7:30 pm – 9:15 pm

Meeting and Lecture, Presidio Officers Club

Saturday September 23, 6:30 pm – 11:00 pm

Mt. Tam Public Astronomy Night: Lecture and Star Party
Mountain Theater and Rock Springs Parking Lot

Thursday September 28, 8:00 pm – 11:00 pm

City Star Party, Presidio Main Parade Ground

BAY AREA ASTRONOMY EVENTS

Each month, long-time SFAA member Kenneth Lum assembles and sends out a list of Bay Area Astronomy events.

As each month unfolds, check the following link for information regarding additional events:

<http://tech.groups.yahoo.com/group/bayastro/?v=1&t=directory&ch=web&pub=groups&sec=dir&slk=94>

* * * * *
**GET REAL, LIVE HELP
WITH YOUR TELESCOPE!**
* * * * *

Are you a new telescope owner? Or perhaps you could use some help with alignment, collimation or other adjustments? Collimating a reflector, like playing guitar or dancing the tango, can, with great effort, be learned from reading, but it is much easier and more enjoyable to learn hands-on from somebody who already knows how to do it.

Bring your telescope to a Star Party – we'll be happy to help!

03.

SFAA NEEDS YOU: VOLUNTEER OPPORTUNITIES | ANTHONY BARREIRO

Volunteers Needed for SFAA Star Parties

Throughout the year SFAA provides two or three star parties a month. Every month of the year we do a City Star Party at various locations in San Francisco and a members night on Mount Tamalpais. From April through October, in collaboration with Mt. Tam State Park, the Friends of Mt. Tam, and Wonderfest, SFAA provides telescope observing as part of the monthly public astronomy program. That's a total of 31 star parties a year! We need a couple of experienced SFAA members to serve as contact people for each of these events. If you've been to at least a few star parties, you're familiar with the procedures, and you're able to commit to attending a specific star party, we need your help.

Star party contact persons check the weather forecast during the days before a star party, keep in touch with the other contact person, and make a decision whether or not to cancel the event because of rain, or because of high fire danger on Mt. Tam. On the day of the star party, contact people arrive early, welcome and orient members, and hold a brief huddle for all the telescope operators to review procedures and answer questions. On Mount Tamalpais contact people make sure that every vehicle belongs to an SFAA member and has a parking pass. For the Mt. Tam public astronomy program, SFAA contact people coordinate with the Friends of Mount Tam volunteers who manage the visitor parking area. Contact people always have plenty of time to set up and use their own equipment and to enjoy the star party. At the end of the night on Mt. Tam, the contact persons need to make sure members know to lock the gate behind them on the way out.

A small number of SFAA members have been serving as contact people for all our star parties. It would be great to have a larger pool of volunteers, so that we could all take turns. If you sign up you will receive one email a month asking people to volunteer for upcoming star parties.

If you're willing to help out, or if you have questions, please contact Anthony Barreiro at secretary@sfaa-astronomy.org.

Snack Volunteers Needed

SFAA also needs members to volunteer to bring **light refreshments** to our monthly **meetings and lectures** at the Presidio Officers Club, on the **Third Tuesday of Each Month**. Refreshments help to create a welcoming, sociable atmosphere for members and guests. If a few members each bring something, there's less burden on any one member, and we'll have a good variety of snacks and beverages. You may donate snack items or simply provide receipts to be reimbursed for your expenses, and your fellow members will be grateful to you! If you can bring refreshments, please send an email to Linda Mahan, speakerchair@sfaa-astronomy.org

Let Linda know which month or months you can help with, and what you would like to bring.

Ongoing Opportunities to Participate in our SFAA Club

SFAA is also looking for volunteers to help in these areas:

- **Star Parties** – both on Mt. Tam and for City Star Parties
- **Marketing** – we can use help posting SFAA event updates to SFGate, SF FunCheap, Eventful, Bay Area Science, etc.
- **Above The Fog** – submit an occasional article, astrophoto and/or serve as a member of the editorial team.

Please send an email to Michael Patrick at president@sfaa-astronomy.org if you're interested.

On behalf of the board of directors and your fellow SFAA members, thank you for your willingness to help out!

04.

SFAA IN THE COMMUNITY: EVENT SUMMARIES

Mt. Tam Members' Night, July 22 | **ANTHONY BARREIRO**

Sometimes everything comes together to make for a perfect night. SFAA's August 22 Mount Tamapais members night star party was such a moment.

The event was well attended -- 25 or 30 members and guests and about a dozen telescopes, including five big Dobsonians. The volunteer contact people -- PJ Cabrera, Jim Koulias, Alan Powell, and Kate Mangan-Cabrera -- made sure everything ran smoothly. A brief huddle at sunset gave everyone a chance to introduce ourselves, new members asked questions, and experienced members shared advice and their observing plans. There were several brand new members who were very excited to be learning constellations, looking through telescopes, and seeing the naked-eye milky way. Long-time member Dean Gustafson was able to attend his first SFAA star party in a couple of years, with a friend who helped him set up his scope (it was good to see you, Dean).

We had beautiful dramatic clouds at sunset that completely cleared out by dark. The weather stayed clear, calm, and dry all night long. The seeing was amazing, with great views of Saturn and the summer Milky Way. The International Space Station made two very bright flyovers, 92 minutes apart -- it's amazing to think that the astronauts had orbited the entire Earth between flyovers.

Even the state park ranger was very considerate of our night vision, turning off his headlights every time he drove by. And members organized themselves to leave in a few groups throughout the evening, rather than singly, which further protected everyone else's views of the faint fuzzies.

We have a Members Night on Mt. Tam every month. The next one will be August 19. If you're going, please make sure you have your state parks parking pass, and plan to arrive at least a half hour before sunset at 7:55 pm.

See you on the Mountain.

Photo credits:

Sunset huddle pictures, Tom Kellogg

Milky Way, Exodus Sit





By Exodus Sit

05.

THE URBAN ASTRONOMER BLOG: PERSEID METEOR SHOWER 2017 | PAUL SALAZAR

The annual Perseid Meteor Shower will peak August 11 - 13, offering patient viewers a chance to see 10s or even 100s of meteors per hour if you view from a dark location. The Perseid shower is one of the year's best meteor showers, reliably delivering the twinkling and elusive flits of light that dash across the sky in sheer silence, sometimes in the north, south, east or west. Meteor showers are not for the impatient, but rather require a viewer to relax and enjoy the glorious summer night sky and simply stare up and wait while the Earth plunges through a rich meteor stream. From your location on the planet you need to simply have a big view (the more unobstructed, the better) and somewhat or very dark skies, and then some degree of focus on well ... nothing. Just by looking up and gazing, you will see the meteors.



Image credit © Matthew Dieterich.

Meteors have a delightful and tantalising way of appearing with a burst of light, moving at incredible speed for maybe 1/4 or 1/2 second, and then vaporising and flickering out as fast as they arrived. During a shower like the Perseids, you can rest assured that they are happening all around you all the time but the majority are just too small and too faint for our eyes to perceive. And you can also rest assured that many more are happening outside of your line of sight, as they may appear behind you or to your left or right and elude detection. So one of my favourite ways to see a meteor shower is with a group where you have many pairs of eyes on the sky and many reports of 'ooh, look at that' or 'wow, that was great' happening all around you. It is a wonderful communal activity that keeps the momentum strong since meteor showers, when viewed alone, can go for many minutes without producing anything. Teamwork ensures that no meteor is left unseen. So if you have a chance, join a group (or just find a few friends) who will be staying up to see what they can see.

The Perseids this year will be competing with moonlight each night. In San Francisco, the waxing gibbous moon rises at 10:37 pm on Friday 11th, 11:12 pm on Saturday 12th, and 11:49 pm on Sunday 13th. So take in the view while the moon is below the horizon and enjoy a few hours of meteors each evening. Meteor showers tend to get better as the night goes on, so Saturday and Sunday offer better chances of seeing meteors than Friday. Best of luck, enjoy, and have fun!

Long-time SFAA Member, Paul Salazar is "The Urban Astronomer". In case you haven't met Paul, here is an excerpt from his blog profile: In 2005 I began writing a column for the San Francisco Waldorf School newsletter called "The Urban Astronomer." I started this blog in 2007 as a place to archive my articles and to offer additional insights on the night sky - even if you live in a big city. In 2008 I became an occasional guest on the KFOG Morning Show, and more recently on KALW and KGO. Archived shows are posted on the blog. Check out the blog at: <http://urbanastronomer.blogspot.de>

***** Perseid Meteor Shower Viewing Party *****

The SFAA and the Friends of Mt. Tam are co-sponsoring a members-only event on Saturday August 12th at our usual viewing area on Mt. Tam to enjoy a few hours of meteor viewing from the Rock Spring parking area. At this time, the members-only have already sold out so there is no more space for guests. We encourage you to view the Perseids from wherever you are.

***** Call For Design Submissions *****

Calling all Designers! The SFAA Board is excited to announce that we are looking to create SFAA Hoodies; the exact item that all well-dressed night sky watchers need!

Three simple steps:

1. Think up a great design idea
2. Draw it
3. Submit it to president@sfaa-astronomy.org

Got more than 1 idea? Fantastic. Repeat steps 1 – 3.

Your design might be the winner. What are you waiting for? The sky's the limit!

06.



ECLIPSE 101 ▾ EVENTS ▾ SCIENCE ▾ ACTIVITIES ▾ EDUCATION ▾ RESOURCES ▾

ECLIPSE 101 >> Safety

Safety



How to View the 2017 Solar Eclipse Safely

A solar eclipse occurs when the moon blocks any part of the sun. On Monday, August 21, 2017, a solar eclipse will be visible (weather permitting) across all of North America. The whole continent will experience a partial eclipse lasting 2 to 3 hours. Halfway through the event, anyone within a roughly 70-mile-wide path from Oregon to South Carolina (<https://go.nasa.gov/2pC0lhe>) will experience a brief total eclipse, when the moon completely blocks the sun’s bright face for up to 2 minutes 40 seconds, turning day into night and making visible the otherwise hidden solar corona — the sun’s outer atmosphere — one of nature’s most awesome sights. Bright stars and planets will become visible as well.



Looking directly at the sun is unsafe except during the brief total phase of a solar eclipse (“totality”), when the moon entirely blocks the sun’s bright face, which will happen only within the narrow path of totality (<https://go.nasa.gov/2pC0lhe>).

The only safe way to look directly at the uneclipsed or partially eclipsed sun is through special-purpose solar filters, such as “eclipse glasses” (example shown at left) or hand-held solar viewers. Homemade filters or ordinary sunglasses, even very dark ones, are not safe for looking at the sun. To date four manufacturers have certified that their eclipse glasses and handheld solar viewers meet the ISO 12312-2 international standard for such products: Rainbow Symphony, American Paper Optics, Thousand Oaks Optical, and TSE 17.



Inspect your solar filter before use; if scratched or damaged, discard it. Read and follow any instructions printed on or packaged with the filter. Always supervise children using solar filters.

- Stand still and cover your eyes with your eclipse glasses or solar viewer before looking up at the bright sun. After glancing at the sun, turn away and remove your filter — do not remove it while looking at the sun.

- Do not look at the unclipped or partially eclipsed sun through an unfiltered camera, telescope, binoculars, or other optical device. Similarly, do not look at the sun through a camera, a telescope, binoculars, or any other optical device while using your eclipse glasses or hand-held solar viewer — the concentrated solar rays will damage the filter and enter your eye(s), causing serious injury. Seek expert advice from an astronomer before using a solar filter with a camera, a telescope, binoculars, or any other optical device.
- If you are within the path of totality (<https://go.nasa.gov/2pC0lhe>), remove your solar filter only when the Moon completely covers the sun's bright face and it suddenly gets quite dark. Experience totality, then, as soon as the bright sun begins to reappear, replace your solar viewer to glance at the remaining partial phases.



An alternative method for safe viewing of the partially eclipsed sun is pinhole projection. For example, cross the outstretched, slightly open fingers of one hand over the outstretched, slightly open fingers of the other. With your back to the sun, look at your hands' shadow on the ground. The little spaces between your fingers will project a grid of small images on the ground, showing the sun as a crescent during the partial phases of the eclipse.

A solar eclipse is one of nature's grandest spectacles. By following these simple rules, you can safely enjoy the view and be rewarded with memories to last a lifetime. More information:

eclipse.aas.org eclipse2017.nasa.gov

Additional Safety Information

An eclipse is a rare and striking phenomenon you won't want to miss, but you must carefully follow safety procedures. Don't let the requisite warnings scare you away from witnessing this singular spectacle! You can experience the eclipse safely, but it is vital that you protect your eyes at all times with the proper solar filters. No matter what recommended technique you use, do not stare continuously at the sun. Take breaks and give your eyes a rest! Do not use sunglasses: they don't offer your eyes sufficient protection. One excellent resource for safe solar eclipse viewing is here:

<http://www.nasa.gov/content/eye-safety-during-a-total-solar-eclipse>

Viewing with Protection -- Experts suggests that one widely available filter for safe solar viewing is number 14 welder's glass. It is imperative that the welding hood houses a #14 or darker filter. Do not view through any welding glass if you do not know or cannot discern its shade number. Be advised that arc welders typically use glass with a shade much less than the necessary #14. A welding glass that permits you to see the landscape is not safe. Inexpensive eclipse glasses have special safety filters that appear similar to sunglasses, but these do permit safe viewing.

Telescopes with Solar Filters – Eclipses are best viewed directly when magnified, which means a telescope with a solar filter or solar telescopes. These will give you a magnified view that will clearly show the progress of an eclipse. Never look through a telescope without a solar filter on the large end of the scope. And never use small solar filters that attach to the eyepiece (as found in some older, cheaper telescopes.)

Pinhole projectors-- Pinhole projectors (<http://solar-center.stanford.edu/observe/>) and other projection techniques are a safe, indirect viewing technique for observing an image of the sun. These provide a popular way for viewing solar eclipses.

Related projection methods -- One viewing technique is to project an image of the sun onto a white surface with a projecting telescope. This is explained further here:

<http://www.astrosociety.org/education/publications/tnl/05/stars2.html>

The Exploratorium demonstrates how to view a planet in transit or an eclipse safely by projecting the image with binoculars: <http://www.exploratorium.edu/transit/how.html> . There are commercially available projection telescopes as well. Besides eye protection during solar eclipse viewing, one needs to pay attention to their personal needs and surrounding.

Please go to <https://eclipse2017.nasa.gov/safety> for additional information and safety tips.

07.

CITIZEN SCIENCE: ECLIPSE MEGAMOVIE PROJECT | BRIAN KRUSE

We're excited to announce an opportunity to contribute to a first-of-its-kind citizen science project: the Eclipse Megamovie!

Representing a collaboration between Google, UC Berkeley, the Astronomical Society of the Pacific and others, the project will use photographs of the upcoming August 21st total solar eclipse to build a movie of the entire eclipse from coast to coast. We need skilled photographers to help create the movie as well as support solar science research. For more on the goals of the project, see UC Berkeley's official press release:

<http://news.berkeley.edu/2017/02/21/megamovie-project-to-crowdsource-images-of-august-solar-eclipse/>

Our aim is to recruit over 1,000 amateur photographers and astronomers who will be on the path of totality on August 21, 2017. Team members receive training and submit a practice image before the eclipse. Once you qualify, you will receive a pin to designate your status as an official photographer for the project. Your name will also be included in the credits of the final Eclipse Megamovie. If you want to participate, visit our website at: <https://eclipsemega.movie> and SIGN IN to apply!

- Basic equipment necessary for participating in the Eclipse Megamovie Project:
- Camera: DSLR (digital single lens reflex)
- Telephoto or zoom lens: minimum focal length of 300mm
- A stable and level tripod
- Ability to identify the GPS coordinates and time to the nearest second



*** * SFAA ECLIPSE SAFETY GLASSES NOW AVAILABLE -- \$1.00 EACH * ***



A solar eclipse occurs when the Moon blocks any part of the Sun. On Monday, August 21, 2017, a solar eclipse will be visible (weather permitting) across all of North America. The whole continent will experience a partial eclipse lasting 2 to 3 hours. Halfway through the event, anyone within a roughly 70-mile-wide path from Oregon to South Carolina will experience a brief total eclipse, when the Moon completely blocks the Sun's bright face for up to 2 minutes 40 seconds, turning day into night and making visible the otherwise hidden solar corona — the Sun's outer atmosphere — one of nature's most awesome sights.

Bright stars and planets will become visible as well.

Looking directly at the Sun is unsafe except during the brief total phase of a solar eclipse ("totality"), when the Moon entirely blocks the Sun's bright face, which will happen only within the narrow path of totality.

The only safe way to look directly at the uneclipsed or partially eclipsed Sun is through special-purpose solar filters, such as "eclipse glasses" (example at left) or hand-held solar viewers.

Get your safety glasses at the next meeting. SFAA is selling them for \$1.00 each.

08.

***** NOTE: NEW SFAA MEETING LOCATION FOR 2017 *****

We are happy to announce that, starting in 2017, we will be meeting at:
The San Francisco Presidio Officers' Club
50 Moraga Avenue, San Francisco, CA 94129

The SFAA meetings will take place in Moraga Hall, which is just inside the main entrance.

(As you may or may not know, the building where we have been meeting is scheduled to be demolished)

The image below illustrates the location of the Presidio Officers' Club relative to our prior location at the Observation Post.

*** * * 7:00pm Doors open | 7:45pm Lecture starts * * ***



09.

AUGUST 15TH LECTURE | YASHAR HEZAVEH, STANFORD, KAVLI INSTITUTE

THE PRESIDIO . PRESIDIO OFFICERS' CLUB, BUILDING 50 . MORAGA HALL

50 Moraga Avenue, San Francisco

7:00 pm Doors Open & Light Refreshments | 7:30 pm Club Announcements | 7:45 pm Speaker

SFAA'S GENERAL MEETINGS OCCUR ON THE 3RD TUESDAY OF EACH MONTH (EXCEPT JANUARY)

“UNVEILING THE DARK UNIVERSE: A TALE OF FISH TANKS, WINE GLASSES, AND THE SMALLEST DARK MATTER CLUMPS”



YASHAR HEZAVEH, HUBBLE FELLOW AT THE KAVLI INSTITUTE FOR PARTICLE ASTROPHYSICS AND COSMOLOGY AT STANFORD UNIVERSITY

What is "dark matter"? This is a question that has preoccupied astrophysicists for many decades. Observations show that 80% of the matter in our universe is in this mysterious, invisible form. In this talk, Dr. Hezaveh discusses how ALMA, the world's most sophisticated radio telescope, is used to observe some of the most distant galaxies of our universe to learn new things about dark matter. On their 12 billion light year journey to us, light rays from these galaxies pass near other galaxies. As this happens, the dark matter halos of the intervening galaxies, large and small, bend their trajectories, causing the images here on the Earth to look distorted, like images in a funhouse mirror.

Brief Bio

Yashar Hezaveh is a Hubble Fellow at the Kavli Institute for Particle Astrophysics and Cosmology at Stanford University.

His research is primarily centered on strong gravitational lensing of high redshift, dusty galaxies, with a special focus on mapping the detailed distribution of dark matter on small scales in lensing halos. Understanding the small scale distribution of dark matter can give us invaluable clues to the nature of dark matter.

Prior to coming to Stanford, he completed his PhD at McGill University (Montreal, Canada) and his honours in physics and astronomy at University of Victoria (Victoria, Canada).

10.

UPCOMING SFAA LECTURES 2017

THE PRESIDIO . PRESIDIO OFFICERS' CLUB, BUILDING 50 . MORAGA HALL

50 Moraga Avenue, San Francisco

7:00 pm Doors Open & Light Refreshments | 7:30 pm Club Announcements | 7:45 pm Speaker

SFAA'S GENERAL MEETINGS OCCUR ON THE 3RD TUESDAY OF EACH MONTH (EXCEPT JANUARY)

SEPTEMBER 19TH | NATALIE BATALHA, SPACE SCIENCES, NASA



"A PLANET FOR GOLDILOCKS: NASA'S SEARCH FOR LIFE BEYOND THE SOLAR SYSTEM"

"Not too hot, not too cold" reads the prescription for a world that's just right for life as we know it. Finding evidence of life beyond Earth is one of the primary goals of science agencies in the United States and abroad. The goal looms closer as a result of discoveries made by NASA's Kepler Mission. Launched in March 2009, Kepler is exploring the diversity of planets and planetary systems orbiting other stars in the galaxy. Finding inhabited environments is a path of exploration that stretches decades into the future. It begins by determining if Goldilocks planets abound. Dr. Batalha will describe the latest discoveries of NASA's Kepler Mission and the possibilities for finding inhabited environments in the not-so-distant future.

OCTOBER 17TH | TOM ABEL, KAVLI INSTITUTE. DIRECTOR OF KIPAC, STANFORD



"HOW THE FIRST THINGS IN THE UNIVERSE CAME ABOUT, AND HOW THEY ENDED UP WITHIN US"

Join us for a fascinating journey through the early universe using the latest computer animations of early star formation, supernova explosions and the build-up of the first galaxies. Dr. Abel's work has shown that the first luminous objects in the universe were very massive stars shining one million times as brightly as our Sun. They died quickly and seeded the cosmos with the chemical elements necessary for life.

One star at a time, galaxies started to assemble just one hundred million years after the Big Bang, and they are still growing now. Computer simulations of these events use the physics of dark matter, of ordinary atoms and molecules, and of expanding space to deliver remarkable insights into the early history of the cosmos.

UPCOMING SFAA LECTURES 2017 (continued)

NOTE:

NOVEMBER LECTURE DATE IS CANCELLED DUE TO THANKSGIVING HOLIDAY

DECEMBER 19TH | BARRY WELSH, UC BERKELEY SSL

"EXOCOMETS: NOW YOU SEE THEM, NOW YOU DON'T"

Using high resolution spectrographs mounted on large aperture ground based telescopes, we have discovered 15 young stars that harbor swarms of exocomets. This lecture will describe attributes of comets in our solar system, and observing techniques to detect evaporating exocomets around young stars. The relevance of Kepler's discovery of "Tabby's Star" will also be discussed.

***** Eclipse Book Signing Event, August 6 at 1-3 PM *****

San Francisco Public Library is pleased to bring astronomer Andrew Fraknoi to the Main Library for a talk titled "August's 'All-American' Eclipse of the Sun and How to View it Safely."

On Aug. 21, there will be an eclipse of the Sun visible throughout North America. People in a narrow path from Oregon to South Carolina will see a spectacular total eclipse, with the Moon briefly covering the Sun, and day turning into night. Everyone else, including those in the Bay Area, will see a partial eclipse, where the Moon covers a good part of the Sun.

On Sunday, Aug. 6, at 1 pm, astronomer Andrew Fraknoi will give a non-technical, family-oriented talk on getting ready for the "All-American" eclipse of the sun. Fraknoi will describe how eclipses work, why they are one of nature's most spectacular sights, exactly when and where the eclipse of 2017 will be visible, and how to observe the eclipse and the sun safely.

The talk will be in the Koret Auditorium, at the Main Library, 100 Larkin St., San Francisco, CA 94102

Everyone attending the event will receive a free pair of safe viewing glasses for observing the sun. Copies of Professor Fraknoi's new children's book on eclipses, *When the Sun Goes Dark*, will be available for sale and signing after the talk. Like the book, the discussion will be appropriate for children 10 years of age or older, and adults.

Andrew Fraknoi has been the chair of the astronomy department at Foothill College and is co-author of *When the Sun Goes Dark*, published by NSTA Press. He serves on the 2017 Eclipse Task Force of the American Astronomical Society, training teachers and librarians to act as guides for the public as the August eclipse approaches. He has appeared regularly on local and national radio, explaining astronomical developments in everyday language and was named California Professor of the Year in 2007. The International Astronomical Union has named Asteroid 4859 Asteroid Fraknoi to honor his contributions to the public understanding of science. Fraknoi will begin teaching in the Fromm program at the University of San Francisco in September.

[The Sky Event of the Decade: August's "All-American" Eclipse of the Sun](#)– Aug. 6, 1-3 p.m., Main Library, 100 Larkin Street, Koret Auditorium:

Media Contact: Mindy Linetzky
(415) 557-4252 / Mindy.Linetzky@sfpl.org

Free images available for publication at: <https://eclipse.aas.org/resources/images-videos>

11. SFAA EXPEDITION 2017

TOTAL SOLAR ECLIPSE

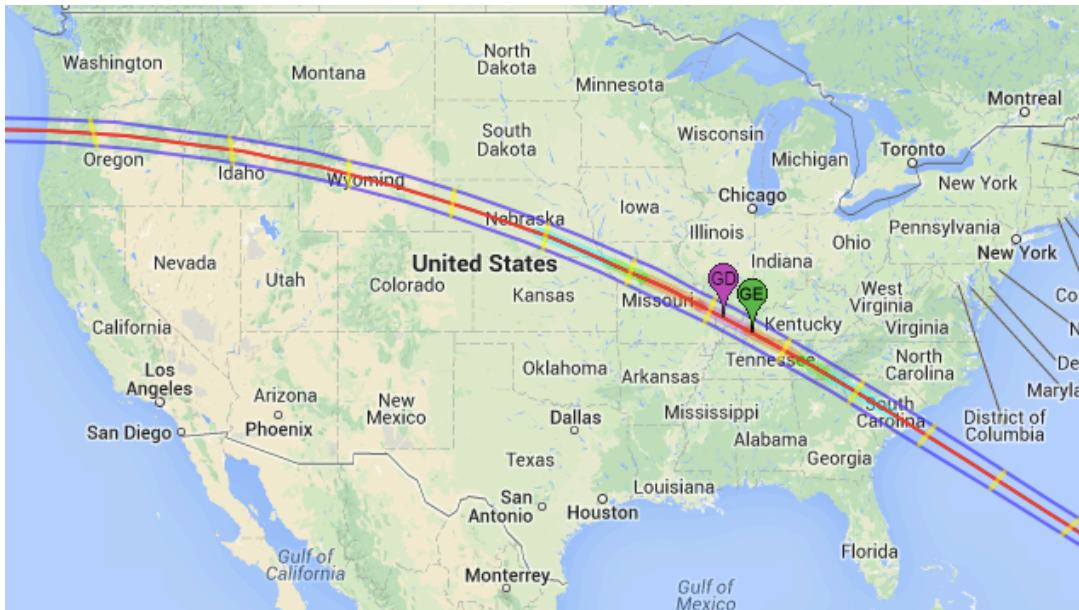
August 21, 2017

Jackson Hole, Wyoming (Teton Mountains)

The San Francisco Amateur Astronomers is organizing an expedition to witness the August 21, 2017 Total Solar Eclipse. The eclipse will be visible across a broad swath of the USA, and club members will gather near Jackson Hole, Wyoming, to witness this spectacle high in the Teton Mountains. The trip is an opportunity for club members to gather in one place along the path of totality and journey together up the mountains for viewing of this spectacular astronomical phenomenon.

Over the past year as we have promoted this event, hotel space in all of the Jackson Hole region has sold out. So at this point in time, we welcome SFAA members to join us for the weekend of August 19th and 20th at our location in Teton Village, and for totality on Monday August 21st. However, you will have to find hotel or camping accommodations elsewhere and drive in. If you wish to join us or just to get updates, send an email to 2017eclipse@sfaa-astronomy.org to receive periodic updates.

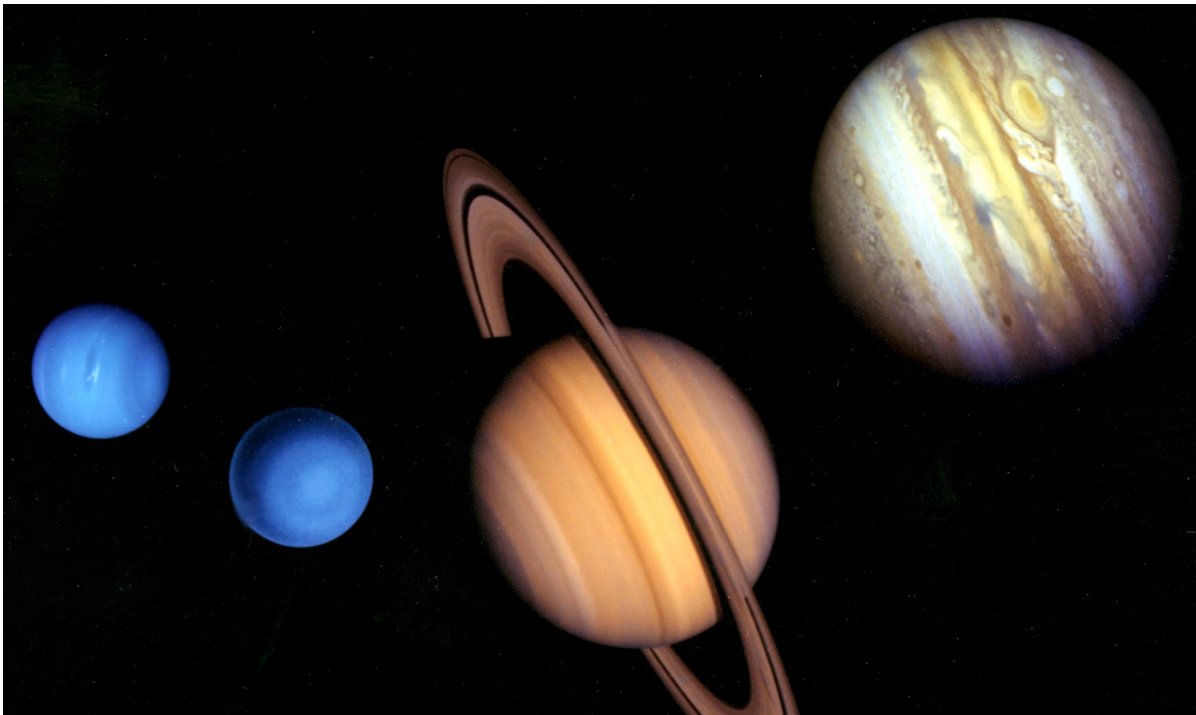
If you have any other questions, send to 2017eclipse@sfaa-astronomy.org.



***** Partial Solar Eclipse Events – San Francisco *****

On August 21st, the entire United States will experience a solar eclipse. The eclipse will be total along a narrow band of the US and partial everywhere else. In the San Francisco area, there will be a viewing event at the [Exploratorium](#), which will open at 9:00 am, and at other locations around the Bay Area such as the San Rafael or Belvedere Tiburon Public Library. To view a partial eclipse you are required to use eye protection, as the dimming of the sun is not sufficient to prevent permanent eye damage.

FIRST AND FARTHEST: HOW THE VOYAGERS BLAZED TRAILS



This montage of images of the planets visited by Voyager 2 was prepared from an assemblage of images taken by the 2 Voyager spacecraft. The Voyager Project is managed for NASA by the Jet Propulsion Laboratory, Pasadena, California. Image Credit: NASA/JPL

Few missions can match the achievements of NASA's groundbreaking Voyager 1 and 2 spacecraft during their 40 years of exploration. Here's a short list of their major accomplishments to date.

Planetary Firsts

Launched in 1977, the Voyagers delivered many surprises and discoveries from their encounters with the gas giants of the outer solar system: Jupiter, Saturn, Uranus and Neptune. Between 1977 and 1990, the mission attained these distinctions:

- First spacecraft to fly by all four planets of the outer solar system (Voyager 2)
- First mission to discover multiple moons of the four outer planets (both spacecraft):
 - 3 new moons at Jupiter
 - 4 new moons at Saturn
 - 11 new moons at Uranus
 - 6 new moons at Neptune
- First spacecraft to fly by four different target planets (Voyager 2)
- First spacecraft to visit Uranus and Neptune (Voyager 2)
- First spacecraft to image the rings of Jupiter, Uranus and Neptune (Voyager 2)
- First spacecraft to discover active volcanoes beyond Earth (on Jupiter's moon Io -- Voyager 1)
- First spacecraft to detect lightning on a planet other than Earth (at Jupiter -- Voyager 1)
- First spacecraft to find suggestions of an ocean beyond Earth (at Jupiter's moon Europa -- both spacecraft)
- First spacecraft to detect a nitrogen-rich atmosphere found beyond our home planet (at Saturn's moon Titan -- Voyager 1)

Heliophysics Firsts

After Voyager 1 departed from Saturn in November 1980, it began a journey to where no human-made object had ever gone before: the space between the stars. On August 25, 2012, it crossed over

into interstellar space, leaving behind the heliosphere -- the enormous magnetic bubble encompassing our Sun, planets and solar wind. Voyager 2 set course for interstellar space after departing from Neptune in August 1989, and is expected to enter interstellar space in the next few years. Together the Voyagers have taught us a great deal about the extent of our sun's influence and the very nature of the space that lies beyond our planets.

- First spacecraft to leave the heliosphere and enter interstellar space (Voyager 1)
- First spacecraft to measure full intensity of cosmic rays -- atoms accelerated to nearly the speed of light -- in interstellar space (Voyager 1)
- First spacecraft to measure magnetic field in interstellar space (Voyager 1)
- First spacecraft to measure density of interstellar medium -- material ejected by ancient supernovae (Voyager 1)
- First spacecraft to measure solar wind termination shock -- the boundary where solar wind charged particles slow below the speed of sound as they begin to press into the interstellar medium (Voyager 2)

Engineering and Computing Firsts and Records

The Voyagers, which launched with nearly identical configurations and instruments, were designed to withstand the harsh radiation environment of Jupiter -- the greatest physical challenge they would ever encounter. Preparations for the peril at Jupiter ensured that the Voyagers would be well equipped for the rest of their journeys, too. Engineering and computing advances that the Voyagers debuted set the stage for future missions.

- First spacecraft extensively protected against radiation, which also set the standard for radiation design margin still in use for space missions today
- First spacecraft protected against external electrostatic discharges
- First spacecraft with programmable computer-controlled attitude and articulation (which means the pointing of the spacecraft)
- First spacecraft with autonomous fault protection, able to detect its own problems and take corrective action
- First use of Reed-Solomon code for spacecraft data -- an algorithm to reduce errors in data transmission and storage, which is widely used today
- First time engineers linked ground communications antennas together in an array to be able to receive more data (for Voyager 2's Uranus encounter)

Beyond that, the Voyager spacecraft continue setting endurance and distance records:

- Longest continuously operating spacecraft (Voyager 2, which passed Pioneer 6's record on Aug. 13, 2012)
- Most distant spacecraft from the Sun (Voyager 1, which passed Pioneer 10's distance on Feb. 17, 1998 and is currently about 13 billion miles, or 21 billion kilometers, away)

The Voyager spacecraft were built by NASA's Jet Propulsion Laboratory, Pasadena, California, which continues to operate both. JPL is a division of Caltech in Pasadena. The Voyager missions are a part of the NASA Heliophysics System Observatory, sponsored by the Heliophysics Division of the Science Mission Directorate in Washington. For more information about the Voyager spacecraft, visit:

<https://www.nasa.gov/voyager>

<https://voyager.jpl.nasa.gov>

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Application for New or Renewing Membership

1. Memberships, with dues payment, are for one year running from standard renewal dates of 1 July to 30 June and 1 January to 31 December. SFAA is a 501(c)(3) nonprofit organization. Membership dues are tax-deductible, as allowed by law.
2. Submitting appropriate dues in April, May, June, July, August, September, membership will run to 30 June of the next year.
3. Submitting appropriate dues in October, November, December, membership will run to 31 December of the next year; submitting appropriate dues in January, February or March, membership will run to 31 December of the same year.
4. Renewals are maintained at the original membership date unless the renewal is made later than the original cutoff date (e.g. September or March as described in 3). In such cases the membership date is shifted to the next renewal date 30 June or 31 December.
5. New or renewal memberships sent in via USPS mail will have membership start date based on postmark date.

This application is for:

New

Renewing

Name: _____

Address: _____

Email: _____

Home Telephone (optional): _____

Cell Phone (optional): _____

Membership Type: Individual \$25.00 Family \$30.00 Student \$10.00 Supporting \$75.00
 Institutional \$40.00 **(All dues tax-deductible as allowed by law.)**

SFAA T-shirt, add \$10.00 and select size: L XL XXL

Please mail to me a Mt. Tamalpais Parking Permit (1 per membership)

To complete the membership process:

- A. Print and fill out this form
- B. Make check or money order payable to San Francisco Amateur Astronomers
- C. Mail this form and payment to:

Treasurer, SFAA
PO Box 15097
San Francisco, CA 94115

Both new and renewing members will receive a verifying email from the SFAA upon completion of the membership process.