ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

Vol. 65, No. 7 – July 2017

IN THIS ISSUE

01. SFAA PRESIDENT'S NOTE | DOCUMENTARY FILM: LIVING WITH THE STARS

At our Member's Only Star Party at the Rock Springs parking lot on 24 June the SFAA and Friends of Mt. Tam hosted some special guests. A film crew from Bink Films came to shoot a documentary about a book and it's authors, Karel and Iris Schrijver titled "Living With The Stars" published by Oxford University Press. Wayne Chesler is the Producer/Director of Bink Films and has worked on a number of documentaries. Karel Schrijvner has a doctorate from the University of Utrecht and his main interest is solar physics. His research focuses on the magnetic activity of the Sun, the coupling of the Sun's magnetic field into the heliosphere and its solar wind, the manifestations of magnetic activity of other Sun-like stars and the impact of solar variability on society. The impact on society is tied to the theme of "Living With The Stars" in that we and everything around us are essentially star-dust, an end result of solar activity. Karel and Iris chatted with me and several members who were setting up their telescopes with the film crew recording. In fact he recalled some years ago giving a lecture to the SFAA at the Randall Museum.

Wayne worked with the SFAA and Friends of Mt. Tam in setting this event up and donated $150.00 to the SFAA as an expression of Bink Films thanks. He mentioned that the documentary will be coming out in the November/December time frame and he would give me notification when it does. The SFAA and Friends will receive some mentions in the credits. I will keep members apprised of the documentary particularly when it is released. In addition to what we observe through our telescopes, we might have a few stars among our midst.

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 JULY 1, 2017 – AUGUST 26, 2017

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

Saturday July 1, 7:30 pm – 11:00 pm
Mt. Tam Public Astronomy Night: Lecture and Star Party
Mountain Theater and Rock Springs Parking Lot

Tuesday July 18, 7:30 pm – 9:15 pm
Meeting and Lecture, Presidio Officers Club

Saturday July 22, 7:00 pm – 2:00 am
Mt. Tam Members Night

Friday - Sunday July 28 - 30
Yosemite Star Party – SFAA members only

Saturday July 29, 7:30 pm – 11:00 pm
Mt. Tam Public Astronomy Night: Lecture and Star Party
Mountain Theater and Rock Springs Parking Lot

Sunday July 30, 8:00 pm – 11:00 pm
City Star Party, Embarcadero at Pier 17, adjacent to Exploratorium

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:
- 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**

Saturday August 26, 7:00 pm – 11:00 pm
Mt. Tam Public Astronomy Night

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

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GET REAL, LIVE HELP WITH YOUR TELESCOPE!

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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

Maker's Faire @ San Mateo Event Center | Douglas Smith

This year's Maker Faire Bay Area was a big success. Makers Faire is a huge DIY festival, which happened May 19-21 at the San Mateo Event Center. Over 1,300 makers shared their passions, ranging from electronics projects, new technologies, science, fabrication, art and crafts- a great variety of interests. San Francisco Amateur Astronomers participated by showing how to make a Dobsonian telescope. Glass grinding demonstrations, including hands on grinding a small mirror generated lots of great questions. Members **Peter Schumacher, David Frey, Douglas Smith, Kathleen McCowin,** and **Kai Qiang** manned the booth outside in gorgeous weather. Douglas also had FirstLight, his homemade 16 ½" Dobsonian out to show a completed project. David and Peter shared their solar scopes. In addition to SFAA, Chabot Science Center and the Astronomical Society of the Pacific also shared telescope making and astronomy interests. There were huge crowds, as the event seems to grow each year!

05. 2017 YOSEMITE STAR PARTY: JULY 28-29

Come join us for our members-only yearly star part at Glacier Point in Yosemite. Members can sign up to join us for a couple days of camping, fun, and astronomy.

If you would like to join us at our group campsite provided by the park service, please email Dave Frey at yosemite2017@sfaa-astronomy.org with your name, if you'll be bringing any family members and whether you have a telescope or not. Priority will be given to those with telescopes.

Anyone can join us at Glacier Point on those nights to view through our scopes and get a tour of our skies in a dark, beautiful area.

Photo: Panoramic View of SFAA Star Party at Glacier Point, 2016

How to Sign Up:

To signup, send an email to yosemite2017@sfaa-astronomy.org

Be sure to put "Yosemite Sign Up" in the subject line to reserve your campsite.

Sign up soon – It's filling up fast!

Remember, the trip is available to MEMBERS ONLY

Since this is a Public Viewing Event that the SFAA attends as guests of the National Parks, all campers are expected to bring a telescope and be willing to host public viewing. The club aims to bring one telescope for every two SFAA members attending.

2017 YOSEMITE STAR PARTY: JULY 28-29 (continued)

About the Trip

The SFAA is provided with FREE admission to Yosemite National Park as well as FREE reserved, shared campgrounds at Bridalveil Group Campground. The campsite is 8.5 miles away from Glacier Point.

We will host two public star parties at Glacier Point, on Friday and Saturday night. We have the public (about 200 – 300 people) from twilight for a few hours, and then the rest of the night (and all day) to ourselves; this is a mighty good deal, considering how some folks come 12,000 miles to see these rocks. The National Park Service limits astronomy clubs to a maximum of 30 SFAA campers. Please do not ask if your friends can come …unless they are SFAA members and have telescopes.

Observing site at Glacier Point

The observing area is mostly open, with incredible views from about NNW to the east, around to due south. The horizon from south around to the west is partly blocked by tall trees. Still, there is a lot of open sky, and typically, the seeing and transparency are excellent. It has warm temperatures of 70 to 90 during the day, and cool to chilly 40′s at night, due to the elevation of 7200 feet.

Star Party

One of the rangers does a sunset talk, and then delivers the crowd to us. Following that, a member of the club will give an evening talk, (want to volunteer?) The public will have white flashlights, and we need to be tolerant of that. We will have 3 club members with red brake light tape to politely cover the offending flashlights. Expect many questions from the public.

The Reward

By around 9:30 or so, we will have the place to ourselves, and can stay until dawn if you so choose. Scopes must be removed when we quit, then set up again on Saturday. Some of us may set up sun scopes during the afternoon, show Half Dome festooned with rock climbers, and invite people to come back again after sunset.

Gastronomic Astronomic

Early Saturday eve is the traditional potluck meal and is always tons of fun. Please provide enough food for ~ say 3 or 4 people. Salads, main courses, pu pu's and desserts are all welcome. The question is: Who will have the best astronomical gastronomical theme of incredible edibles this year? Remember the Brown Dwarfs? Prizes will be awarded! Please remember this repast takes time. It's better to start our own gastronomic party early so that there's no need to rush for set up Saturday evening on Glacier Point.

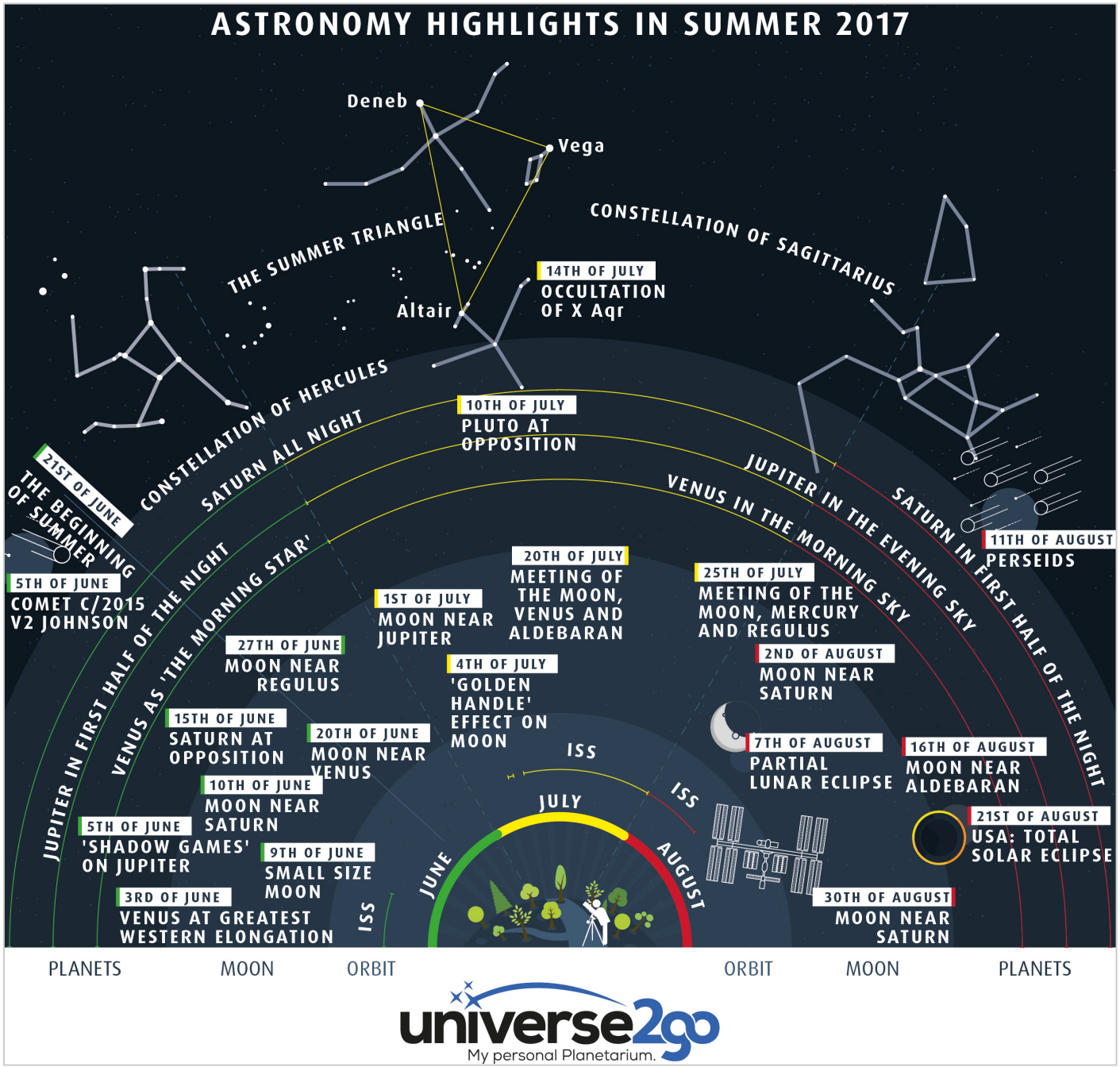
Check the National Weather Service for up-to-date weather info on Yosemite Park current weather and conditions.

See you at the campsite.

06. THE URBAN ASTRONOMER BLOG: THE SUMMER SKY AWAITS| PAUL SALAZAR

The magnificent summer sky awaits, with dazzling views into our home galaxy, a host of first magnitude stars that enhance some of the finest constellations in the night sky, planets that shimmer in a telescope or binoculars, a meteor shower, and of course this year only (!) a Great Eclipse.

The Milky Way: although the cloudy band of stars that make up the central plane of our home galaxy is not visible in cities, binoculars still reveal many of the fine structures to be found in the Milky Way, albeit less spectacular and colorful than the dark sky view. Nonetheless, a leisurely tour from due south (between Scorpius and Sagittarius) to zenith (directly overhead) will reveal numerous clusters, nebulae and colorful groupings of stars.



First Magnitude Stars: The Summer Triangle features Vega, Deneb and Altair in a bright triangle rising from the east to tower overhead in mid-summer. Other top-10 stars include Arcturus and blue-white Spica in the west and orange-red Antares in the south.

Planets That Shimmer: Jupiter continues to dominate the southwest sky, gradually moving toward the west as summer wears on. Saturn, just past opposition and glowing a bright milky white near Antares, is visible nearly all night tracing out a low arc across the southern sky from east to west.

A Meteor Shower: the Perseid Meteor Shower peaks on Aug 11-12, and the waxing moon will be a distraction but not a particularly bad one given the circumstances. It's always a pleasure to find a dark spot and a blanket or easy chair for enjoying the bright flashes and streaks of light that punctuate the warm summer night.

A Great Eclipse: Need I say more? So much has been written about this once-in-a-lifetime event on August 21st already but if you can't get enough then check out this website. And just do it. Drive to the Centerline. Really.

Enjoy the many highlights the summer has to offer!

Image courtesy of Universe2Go.

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

* * * 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!

07.

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 uneclipsed 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.

08. 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

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* * 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.

09.

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

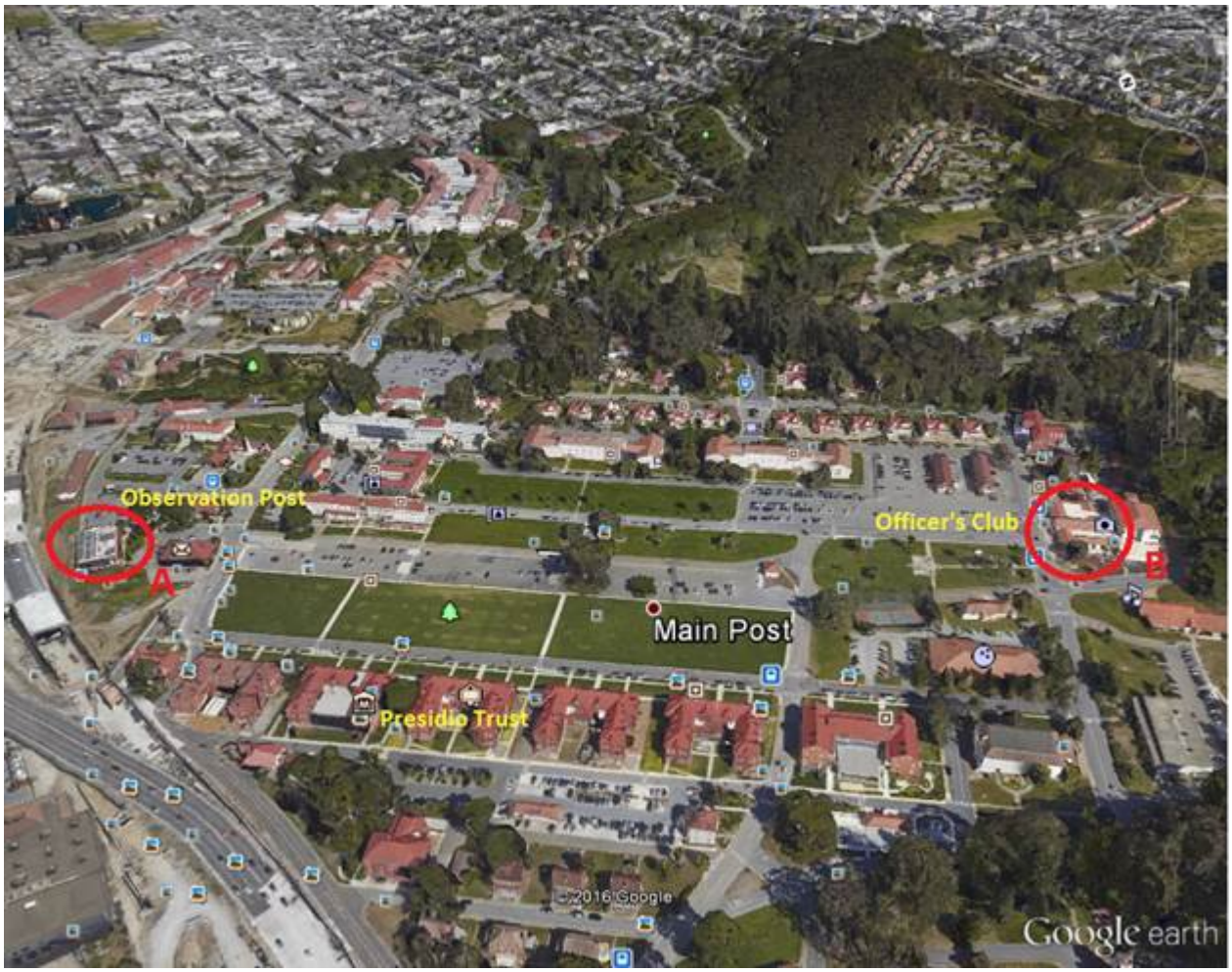
We are happy to announce that, starting in 2017, we will be meeting at:
The San Francisco Presidio Officers' Club
50 Moraga Avenue, San Francisco, CA 94129

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 * * ***



10.

JULY 18TH LECTURE | IMKE DE PATER, UC BERKELEY

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)

"PEERING THROUGH JUPITER'S CLOUDS WITH KECK AND THE VLA"

IMKE DE PATER,
UC BERKELEY, PROFESSOR of ASTRONOMY, EARTH AND PLANETARY SCIENCE

Despite the fact that Jupiter has been observed for decades from the ground and in situ by spacecraft, we still do not know its bulk composition nor do we understand its global atmospheric dynamics well. The sensitivity upgrade to the Very Large Array (VLA), combined with novel data reduction techniques, has enabled us to produce detailed longitude-resolved maps of Jupiter's atmosphere at different wavelengths. Since at these wavelengths the main source of opacity is ammonia gas, our maps provide a 3D picture of ammonia gas in Jupiter's atmosphere, within and below the planet's visible cloud layers. These maps reveal upward and downward motions within the turbulent atmosphere, and bear a striking resemblance to visible- light images taken by amateur astronomers and Hubble.

At the 10-m Keck telescope we use 5-micron spectroscopy, which provides complementary information on cloud altitudes and composition. The results provide important context for NASA's Juno spacecraft that arrived at Jupiter on July 4th, 2016, after a five-year flight.

Brief Bio

Imke de Pater is a Professor in the Department of Astronomy at UC Berkeley, and a world-renowned planetary scientist. She is an authority on modeling and mapping the planets of our solar system, and led a worldwide campaign to observe the impact of comet Shoemaker-Levy 9 with Jupiter in 1994. This lead to a detailed investigation of the effects of impacts on the magnetospheric environment of Jupiter. Her research interests include: infrared observations on the Keck, Gemini and VLT telescopes. She also observes the giant planets at radio wavelengths, using the Very Large Array, ALMA and LOFAR.

Many exciting discoveries include impacts on Jupiter, volcanism on Io, clouds on Titan and Uranus and planetary ring systems.

View her website at: http://astron.berkeley.edu/~

11. 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)

AUGUST 15TH | YASHAR HEZAVEH, HUBBLE FELLOW AT THE KAVLI INSTITUTE FOR PARTICLE ASTROPHYSICS AND COSMOLOGY AT STANFORD UNIVERSITY

"UNVEILING THE DARK UNIVERSE: A TALE OF FISH TANKS, WINE GLASSES, & THE SMALLEST DARK MATTER CLUMPS"

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.

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 Unites 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.

UPCOMING SFAA LECTURES 2017 (continued)

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. The first luminous objects were massive stars that seeded the cosmos with the chemistry needed for life.

November 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.

* * * Commonwealth Club Lecture * * *

A total solar eclipse will be visible in the continental US for the first time in 38 years! To get the inside scoop on all things solar eclipse, join us as astronomer Andrew Fraknoi describes how solar eclipses work and how and where you can view it safely on August 21. Courtesy of Google, all attendees will receive complimentary solar eclipse glasses to safely view the phenomenon.

Andrew Fraknoi is the Chair of the Astronomy Department at Foothill College, and has co-authored a new children's book about eclipses, When the Sun Goes Dark, available to be purchased and signed at the conclusion of the event. If you are interested in this event, or would like to know about group discounts, you may contact us at any time.

WHAT:
The Sky Event of the Decade: The "All-American" Eclipse of the Sun on August 21

WHEN:
Mon, July 31, 2017 / 6:30 PM – 8:00 PM PDT

WHERE:
The Commonwealth Club
555 Post St.
San Francisco, CA

GET TICKETS:
https://www.eventbrite.com/e/the-sky-event-of-the-decade-the-all-american-eclipse-of-the-sun-on-august-21-tickets-34242485195?aff=Outreach

12. SFAA EXPEDITION 2017

TOTAL SOLAR ECLIPSE

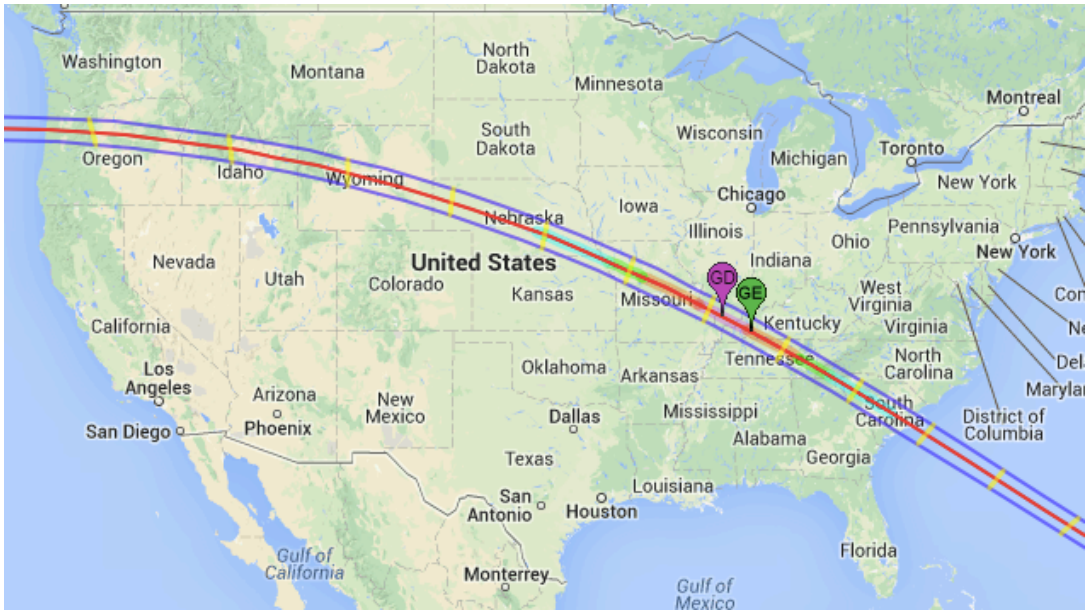
August 21, 2017

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.



NASA'S JUNO SPACECRAFT TO FLY OVER JUPITER'S GREAT RED SPOT JULY 10

This true color mosaic of Jupiter was constructed from images taken by the narrow angle camera onboard NASA's Cassini spacecraft on December 29, 2000, during its closest approach to the giant planet at a distance of approximately 10 million kilometers (6.2 million miles).

It is the most detailed global color portrait of Jupiter ever produced; the smallest visible features are approximately 60 kilometers (37 miles) across. The mosaic is composed of 27 images: nine images were required to cover the entire planet in a tic-tac-toe pattern, and each of those locations was imaged in red, green, and blue to provide true color. Although Cassini's camera can see more colors than humans can, Jupiter's colors in this new view look very close to the way the human eye would see them.

Everything visible on the planet is a cloud. The parallel reddish-brown and white bands, the white ovals, and the large Great Red Spot persist over many years despite the intense turbulence visible in the atmosphere. The most energetic features are the small, bright clouds to the left of the Great Red Spot and in similar locations in the northern half of the planet. These clouds grow and disappear over a few days and generate lightning. Streaks form as clouds are sheared apart by Jupiter's intense jet streams that run parallel to the colored bands. The prominent dark band in the northern half of the planet is the location of Jupiter's fastest jet stream, with eastward winds of 480 kilometers (300 miles) per hour. Jupiter's diameter is eleven times that of Earth, so the smallest storms on this mosaic are comparable in size to the largest hurricanes on Earth.

Unlike Earth, where only water condenses to form clouds, Jupiter's clouds are made of ammonia, hydrogen sulfide, and water. The updrafts and downdrafts bring different mixtures of these substances up from below, leading to clouds at different heights. The brown and orange colors may be due to trace chemicals dredged up from deeper levels of the atmosphere, or they may be byproducts of chemical reactions driven by ultraviolet light from the Sun. Bluish areas, such as the small features just north and south of the equator, are areas of reduced cloud cover, where one can see deeper.

For more information, see the Cassini Project home page, http://saturn.jpl.nasa.gov and the Cassini imaging team home page, http://ciclops.org. The imaging team is based at the Space Science Institute, Boulder, Colo.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the Cassini mission for NASA's Office of Space Science, Washington, D.C.

Image Credit:NASA/JPL/Space Science Institute

Just days after celebrating its first anniversary in Jupiter orbit, NASA's Juno spacecraft will fly directly over Jupiter's Great Red Spot, the gas giant's iconic, 10,000-mile-wide (16,000-kilometer-wide) storm. This will be humanity's first up-close and personal view of the gigantic feature -- a storm monitored since 1830 and possibly existing for more than 350 years.

"Jupiter's mysterious Great Red Spot is probably the best-known feature of Jupiter," said Scott Bolton, principal investigator of Juno from the Southwest Research Institute in San Antonio. "This monumental storm has raged on the solar system's biggest planet for centuries. Now, Juno and her cloud-penetrating science instruments will dive in to see how deep the roots of this storm go, and help us understand how this giant storm works and what makes it so special."

The data collection of the Great Red Spot is part of Juno's sixth science flyby over Jupiter's mysterious cloud tops. Perijove (the point at which an orbit comes closest to Jupiter's center) will be on Monday, July 10, at 6:55 p.m. PDT (9:55 p.m. EDT). At the time of perijove, Juno will be about 2,200 miles (3,500 kilometers) above the planet's cloud tops. Eleven minutes and 33 seconds later, Juno will have covered another 24,713 miles (39,771 kilometers) and will be directly above the coiling crimson cloud tops of Jupiter's Great Red Spot. The spacecraft will pass about 5,600 miles (9,000 kilometers) above the Giant Red Spot clouds. All eight of the spacecraft's instruments as well as its imager, JunoCam, will be on during the flyby.

On July 4 at 7:30 p.m. PDT (10:30 p.m. EDT), Juno will have logged exactly one year in Jupiter orbit. At the time, the spacecraft will have chalked up about 71 million miles (114.5 million kilometers) in orbit around the giant planet.

"The success of science collection at Jupiter is a testament to the dedication, creativity and technical abilities of the NASA-Juno team," said Rick Nybakken, project manager for Juno from NASA's Jet Propulsion Laboratory in Pasadena, California. "Each new orbit brings us closer to the heart of Jupiter's radiation belt, but so far the spacecraft has weathered the storm of electrons surrounding Jupiter better than we could have ever imagined."

Juno launched on Aug. 5, 2011, from Cape Canaveral, Florida. During its mission of exploration, Juno soars low over the planet's cloud tops -- as close as about 2,100 miles (3,400 kilometers). During these flybys, Juno is probing beneath the obscuring cloud cover of Jupiter and studying its auroras to learn more about the planet's origins, structure, atmosphere and magnetosphere.

Early science results from NASA's Juno mission portray the largest planet in our solar system as a turbulent world, with an intriguingly complex interior structure, energetic polar aurora, and huge polar cyclones.

JPL manages the Juno mission for the principal investigator, Scott Bolton, of Southwest Research Institute. The Juno mission is part of the New Frontiers Program managed by NASA's Marshall Space Flight Center in Huntsville, Alabama, for the Science Mission Directorate. Lockheed Martin Space Systems, Denver, built the spacecraft. JPL is a division of Caltech in Pasadena. More information on the Juno mission is available at:

https://www.nasa.gov/juno

http://missionjuno.org

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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.