ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

Vol. 65, No. 2 – February 2017

IN THIS ISSUE

CALL FOR VOLUNTEERS

SFAA is looking for volunteers to help at Star Parties – both on Mt. Tam and for City Star Parties. Please send an email to Michael Patrick at president@sfaa-astronomy.org if you're interested.

01.

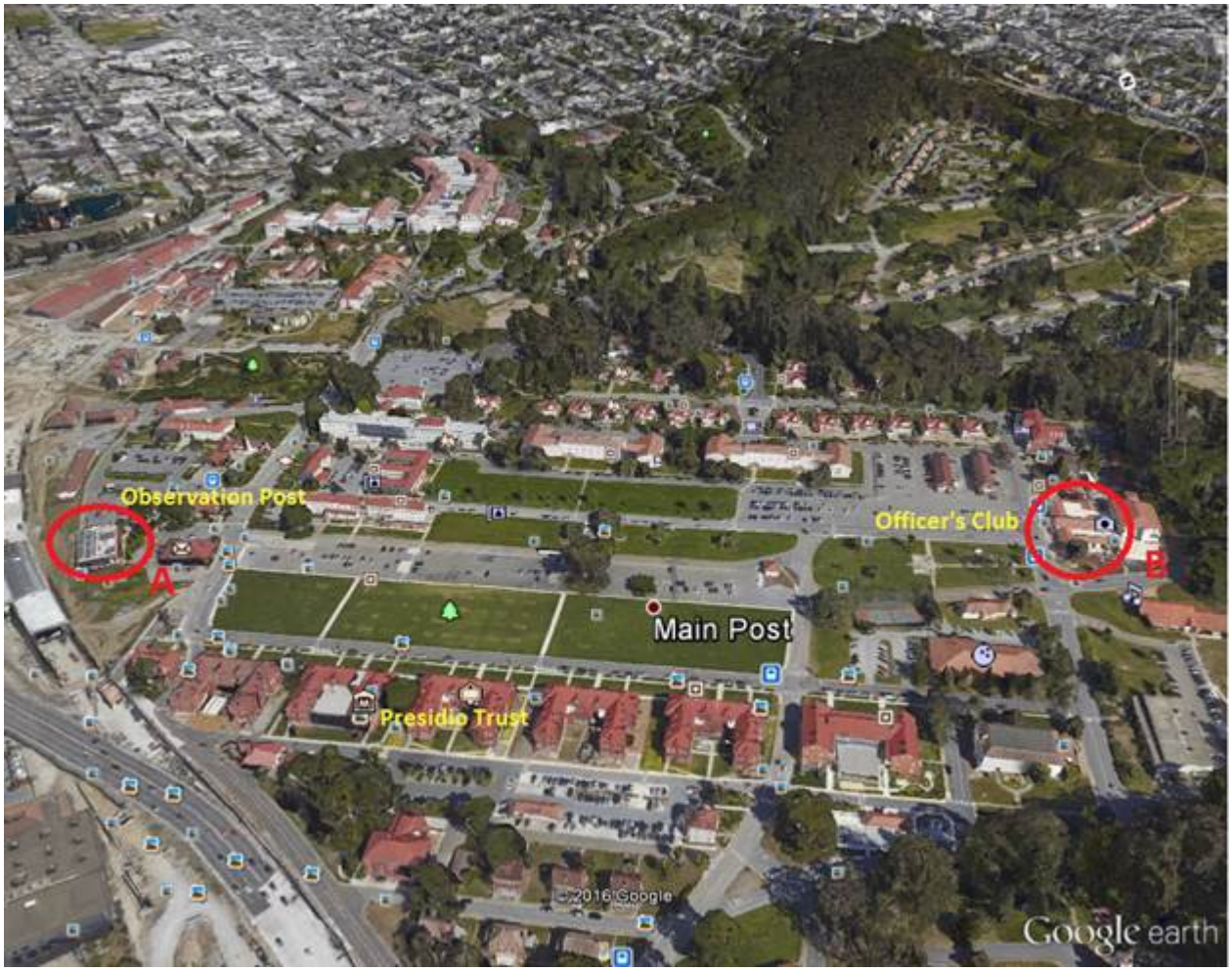
*****NOTE: NEW SFAA MEETING LOCATION FOR 2017*****

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.



02.

FEBRUARY 21ST LECTURE | BRIAN KRUSE

THE PRESIDIO . PRESIDIO OFFICERS' CLUB, BUILDING 50 . MORAGA HALL
50 Moraga Avenue, San Francisco
7:00 pm Doors Open | 7:30 pm Light Refreshments | 7:45 pm Announcements | 8:00 pm Speaker
SFAA'S GENERAL MEETINGS OCCUR ON THE 3RD TUESDAY OF EACH MONTH (EXCEPT JANUARY)

"MARS AND THE HUMAN IMAGINATION"

BRIAN KRUSE, ASTRONOMICAL SOCIETY OF THE PACIFIC (ASP) & BOARD MEMBER, SFAA

Mars has long been an object of intense interest in ancient and modern myths. Its ruddy glow inspiring visions of conflict and war, and its surface markings creating a whole genre of popular (mis)representations of Mars as the abode of life in a variety of forms. In this presentation, discover how popular culture has represented, and misrepresented Mars while sparking a special interest most all have in what is actually taking place on the planet most similar to earth in our solar system. NASA missions have returned a plethora of images and information about what Mars is really like. Find out the latest about what is known about the red planet, and what still remains for investigation and discovery on future missions.

Brian Kruse is the Director of the Teacher Learning Center and Formal Education Programs at the Astronomical Society of the Pacific (ASP), where he manages and coordinates a suite of programs, including the Project ASTRO National Network, and San Francisco Bay Area Project ASTRO. As a member of the CosmoQuest and NASA Night Sky Network teams, he works to engage people in space science content through webinars and citizen science projects. He also edits the online newsletter for teachers The Universe in the Classroom. In addition, Kruse writes the Education Matters column for Mercury magazine, a quarterly publication of the ASP.

A veteran classroom teacher, Kruse has taught middle school earth science and physical science, and high school physics, earth science, and physical science. He served as a coordinator for the NASA Explorer Schools project at NASA Ames Research Center in Mountain View, California. Kruse obtained and M.S. in Aviation and Space Science from Oklahoma State University. He is particularly interested in how people learn and creating opportunities for teachers to incorporate more inquiry-based learning in their classrooms.

In addition to work and play, Kruse is currently serving as a Regional Director for NSELA, the National Science Education Leadership Association, and on the Board of Directors for the San Francisco Amateur Astronomers.

You can check out his blog at musingsontheplanet.com

03.

UPCOMING SFAA LECTURES 2017

THE PRESIDIO . PRESIDIO OFFICERS' CLUB, BUILDING 50 . MORAGA HALL
50 Moraga Avenue, San Francisco
7:00 pm Doors Open | 7:30 pm Light Refreshments | 7:45 pm Announcements | 8:00 pm Speaker
SFAA'S GENERAL MEETINGS OCCUR ON THE 3RD TUESDAY OF EACH MONTH (EXCEPT JANUARY)

MARCH 21ST | ALAN AGRAWAL, AMATEUR ASTRONOMER AND HISTORIAN

"GALILEO'S TELESCOPES AND OBSERVATIONS - THE GREAT INFLECTION POINT IN THE HISTORY OF SCIENCE"

In 1609 Galileo Galilei significantly improved the optical performance of the telescope and began a series of celestial observations that dramatically changed our understanding of the universe and our place in it. He developed a new method for reliably comprehending phenomena in the world around us, and so correctly has been called the father of modern science. This talk will lay out the key developments in the history of science related to astronomy preceding Galileo, describe in detail what is known about the optics and construction of his telescopes, and then discuss his observations and how they radically changed the science of astronomy.

Photo credit: Portrait of Galileo Galilei by Giusto Sustermans

APRIL 18TH | ROGER BLANDFORD, PH.D., KIPAC STANFORD UNIVERSITY

"NEUTRON STARS AND PULSARS: THE INSIDE STORY"

Predicted in the 1930s and discovered in the 1960s by X-ray and radio astronomers, neutron stars are now known to be the typical result of the evolution of a massive star. There should be nearly of a billion of them in our galaxy alone. Neutron stars have roughly ten km radii and can spin six hundred times in a second. They can also have magnetic fields over a million billion times stronger than the Earth's magnetic field. A small fraction of these neutron stars create bright radio emission and they can be observed as periodic radio pulses and are called radio pulsars. Radio pulsars have turned out to be superb cosmic laboratories and to provide tools to explore gravity and its radiation.

04.

<u>* * SPECIAL PRESENTATION PRIOR TO MARCH 21 LECTURE * *</u>
MARCH 21 AT 7:00PM
PHOTOGRAPHER BETH MOON REVISITS THE WORLD'S OLDEST TREES IN THE DARKEST PLACES ON EARTH, USING COLOR PHOTOGRAPHY TO CAPTURE VIBRANT NIGHTTIME SKIES
"ANCIENT SKIES, ANCIENT TREES"

It is only in the rarest and clearest of nights that we can look up at the sky to find a sprinkling of twinkling stars. Surrounded by the bright lights of humanity, the infinite majesty of the cosmos can only be truly enjoyed by those devoted enough to seek it. Critically acclaimed photographer Beth Moon's own appreciation of the dazzling array of stars that shine above us began with her fourteen- year quest, spanning from continent to continent, to record the lives of some of the oldest trees in the world. Her devotion to photographing these ancient, living relics—the subject of her debut bestseller **Ancient Trees: Portraits of Time**—led her to some of the darkest corners of world, where constellations and nebulas shine more brightly, far from the obscuring lights of civilization. Moon's much awaited sequel **Ancient Skies, Ancient Trees** (October 2016, Hardcover) captures the boundless beauty of trees under the night sky, seemingly undisturbed by humans.

A collection of over 50 full-color prints, only achieved through Moon's relentless dedication, undeterred by knee-high mud, windstorms, and distance, **Ancient Skies, Ancient Trees** reveals the rich hues of the night that are often too faint to be seen by the naked eye. Accompanying Moon's introduction, which chronicles her search for the trees documented in this book, are essays by Jana Grcevich, a postdoctoral fellow of astrophysics at the American Museum of Natural History, and Clark Strand, the author of **Waking Up to the Dark: Ancient Wisdom for a Sleepless Night**. In a world where our night skies are becoming increasingly brighter, Grcevich's illuminating text speaks to the uniqueness behind the brilliant impressions of the cosmos reflected in Moon's photography, while Clark Strand's essay ruminates on another natural wonder placed at risk by growing cities and populations—our rare and sacred ancient trees.

A look into some of the most remote locations around the world, **Ancient Skies, Ancient Trees** is an adventure into the wild, wrapped in the elegant binding of your new favorite coffee table book. The ideal purchase for any lover of nature and photography, Beth Moon's photography collection is guaranteed take you on a journey.

Books will be available for sale at the lecture. The SFAA will not receive any of the proceeds from the sales.

05.

SFAA PRESIDENT'S NOTE | HIGHLIGHTS OF THE MEMBERSHIP SURVEY

At our 21 February meeting / lecture – at the Officer's Club – I will give a brief presentation on the 2016 SFAA Membership Survey. We asked a lot of questions – 33 in all - and I won't go through all of them as it would take a significant amount of time, but instead present a condensed version highlighting the main "takeaways". 129 members participated in the survey, which at the time was close to 40% of current membership, so the sample is very indicative of what overall membership looks like and think how the club is doing.

BTW, we still have free SFAA t-shirts for those who took the survey but have yet to pick them up. At the February meeting we will have them available.

If a member has ideas on how the SFAA could do things better, you can give your input at any time by going to our website, clicking The Board, and emailing any of the Officers – President, Vice-President, Secretary or Treasurer (I am the acting Treasurer), or by using the Contact function on our website. We very much welcome your input!

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, Mina Reyes, Douglas Smith, Paul Salazar	

* * * SFAA T-SHIRTS NOW AVAILABLE! * * *

Many of you have asked when those handsome blue SFAA T-Shirts will be available for sale. We have a limited number available, so reserve yours now!

Prices:
$10 for SFAA Members (membership must be current)
$25 for non-Members

Shirts will be available for purchase and/or pick-up at the February 21st lecture at the Presidio Officers' Club. If you need to renew your membership or want to join as a new member, please submit the Membership Application, included as the final page of this newsletter, or from our web site, at: http://www.sfaa-astronomy.org/membership/

06. 2017 MT. TAMALPAIS PUBLIC ASTRONOMY PROGRAM | ANTHONY BARREIRO

On January 15, Matt Jones, Jessica Miller, and Anthony Barreiro of SFAA met with Renee Sayles, Sarah Sinkie, Noah Leader, and Micah Ross of the Friends of Mount Tamalpais, and Tucker Hiatt of Wonderfest, to plan the 2017 Mount Tam Public Astronomy Program.

The Mt. Tam Astronomy Program is a very family-friendly event, with a general-interest lecture by a professional astronomer in the Mountain Theater followed by a laser sky tour from an SFAA member and viewing through SFAA members' telescopes in the Rock Springs Parking Area. For our first program on April 29, Professor Alex Filippenko of UC Berkeley will present "The Glorious All-American Total Solar Eclipse of August 2017!" and Anil Chopra will give the sky tour. Alex Filippenko is a very engaging and entertaining speaker, and Anil's sky tours were very well received last year.

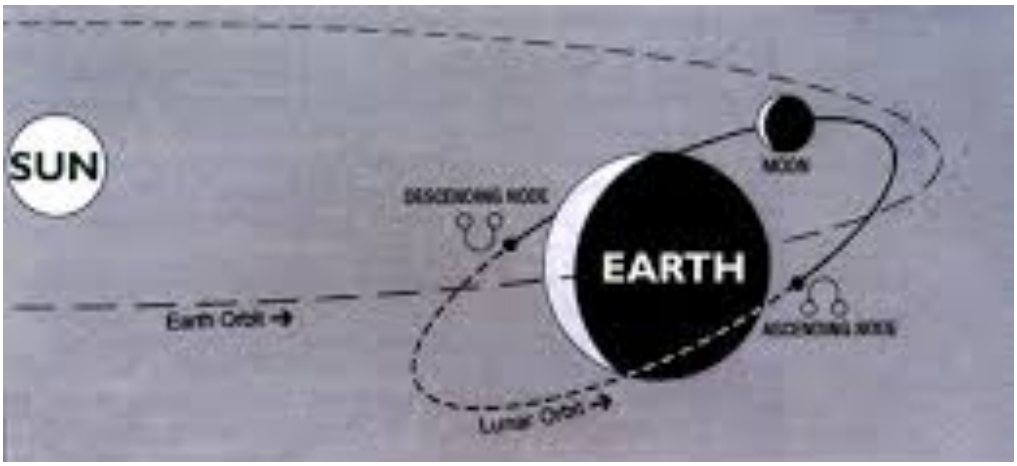
As the program for the rest of the season is finalized, we'll announce details here in **Above the Fog,** and they'll be posted on www.friendsofmttam.org/astronomy **For now, please save the dates: April 29, May 27, July 1, July 29, August 26, September 23, October 28.**

The Mt. Tam Public Astronomy Program is a great way to introduce family and friends to the joys of astronomy and skywatching. A diverse crowd of hundreds of people attend each program -- elders, families with children, university and high school students, all grateful for the opportunity to spend time on the mountain after dark and to learn more about the beautiful universe we live in. Visitors need to leave the park by 11:00 pm; SFAA members with parking passes can stay as late as we like.

It takes a lot of volunteers from Friends of Mt. Tam, SFAA, and Wonderfest to make these programs successful. SFAA members are key in providing the telescopes and expertise for the public observing sessions after the lectures. If you can bring a telescope we've got a spot in the observing area for you! Members without telescopes are also invited to volunteer in the observing area, the parking area, or the Mountain Theater. If you're interested in helping out, or you want more information, please send an email to Anthony Barreiro, secretary@sfaa-astronomy.org

07. THE URBAN ASTRONOMER BLOG: SOLAR ECLIPSES AND THE SAROS CYCLE | PAUL SALAZAR

Eclipses are the outcome of a chance series of alignments between three bodies: the Sun, Moon and Earth. Orbital mechanics and the laws of Kepler ensure that these bodies circle each other in a beautiful series of harmonious ellipses, near perfect circles each with their own periodicity and in the case of the Moon, with its own orbital inclination. The interplay between the various cycles of the Moon orbiting the Earth, the Earth orbiting the Sun, and the Moon's gradually changing orbital inclination lead to patterns that repeat over short, medium and long periods of time as these three bodies align.



Moon's Ascending and Descending Nodes

One of the overall epicycles of these orbits is called the Saros Cycle. At any given time there are many Saros Cycles occurring coincidentally and the Great Eclipse on August 21st is a member of Saros 145. What does this mean? A Saros is an 18 year cycle in which three of the Moon-Earth cycles repeat nearly perfectly, the end effect of which is to create a near duplicate eclipse in this long period of time. The eclipse across Europe in August 1999 was a member of Saros 145, the most recent one of that Saros series until this coming August. In the intervening 6585 days there have been many other lunar and solar eclipses, but none with the exact geometry and timing that we saw in August 1999. So if you get a chance to see the eclipse in August 2017, know that it is virtually identical to the one experienced by observers in Europe 18 years ago. I was in Hungary for the 1999 eclipse and look forward to seeing the Great American Eclipse this summer, a chance to see an old friend again, a pleasant 2 minutes and 40 seconds where I am aligned with the Sun, Moon and Earth but not only just aligned, but in the specific geometrical arrangement that I witnessed 18 years prior.

For a somewhat deeper look into the Saros Cycle, here are the basic three motions. (1) The Moon's orbit around the Earth combined with the Earth's orbit around the Sun leads to the well-known phases of the Moon that repeat every 29.5 days, the time from New Moon to New Moon, and we call that the Synodic Month. (2) At the same time, the Moon's elliptical orbit around the Earth means we have a close approach and a more distant approach every month and the time between two successive closest approaches (Perigee) is 27.55 days, a time period that is called the Anomalistic (Perigee) Month. (3) Finally the Moon orbits the Earth on a slightly inclined orbit so at times the Moon is ascending from below to above the plane of the solar system ('ascending node') or descending from above to below the ecliptic plane ('descending node'). The time period from one ascending node to the next is called a Draconic Month which is 27.21 days. If you combine all three of these time periods, they nearly perfectly repeat after 18 years and 10 or 11 days (depending on the number of

Leap Years between the two years in question), constituting the repetition period of consecutive eclipses in a Saros Series. Saros 145 eclipses took place on August 11th 1999 and on August 21st 2017. And of course the next Saros 145 eclipse will arrive on September 2nd 2035, right on schedule!

Catalog of Solar Eclipses of Saros 145

Seq. Num.	Rel. Num.	Calendar Date	TD of Greatest Eclipse	ΔT s	Luna Num.	Ecl. Type	Gamma	Ecl. Mag.	Lat °	Long °	Sun Alt °	Path Width km	Central Dur.
08634	-39	1639 Jan 04	04:56:19	65	-4465	Pb	1.5650	0.0009	64.6N	80.0E	0		
08679	-38	1657 Jan 14	13:08:11	39	-4242	P	1.5547	0.0171	63.7N	52.7W	0		
08725	-37	1675 Jan 25	21:19:48	18	-4019	P	1.5434	0.0346	62.9N	175.1E	0		
08770	-36	1693 Feb 05	05:27:09	8	-3796	P	1.5276	0.0597	62.2N	44.2E	0		
08815	-35	1711 Feb 17	13:30:15	9	-3573	P	1.5077	0.0919	61.6N	85.4W	0		
08860	-34	1729 Feb 27	21:27:02	10	-3350	P	1.4817	0.1347	61.2N	146.6E	0		
08906	-33	1747 Mar 11	05:18:08	12	-3127	P	1.4504	0.1872	61.0N	20.2E	0		
08951	-32	1765 Mar 21	13:01:45	15	-2904	P	1.4120	0.2524	61.0N	104.3W	0		
08997	-31	1783 Apr 01	20:38:39	17	-2681	P	1.3671	0.3299	61.0N	132.8E	0		
09042	-30	1801 Apr 13	04:08:06	13	-2458	P	1.3152	0.4208	61.3N	11.7E	0		
09087	-29	1819 Apr 24	11:31:59	12	-2235	P	1.2579	0.5225	61.7N	108.0W	0		
09132	-28	1837 May 04	18:48:28	5	-2012	P	1.1934	0.6381	62.3N	133.9E	0		
09175	-27	1855 May 16	02:01:12	7	-1789	P	1.1249	0.7624	62.9N	16.6E	0		
09218	-26	1873 May 26	09:08:56	-2	-1566	P	1.0513	0.8971	63.7N	99.6W	0		
09260	-25	1891 Jun 06	16:15:36	-6	-1343	A	0.9754	0.9981	74.5N	163.8E	12	33	00m06s
09302	-24	1909 Jun 17	23:18:38	10	-1120	H	0.8957	1.0065	82.9N	123.6E	26	51	00m24s
09344	-23	1927 Jun 29	06:23:27	24	-897	T	0.8163	1.0128	78.1N	73.8E	35	77	00m50s
09387	-22	1945 Jul 09	13:27:45	27	-674	T	0.7356	1.0180	70.0N	17.2W	42	92	01m15s
09427	-21	1963 Jul 20	20:36:13	35	-451	T	0.6571	1.0224	61.7N	119.6W	49	101	01m40s
09467	-20	1981 Jul 31	03:46:37	52	-228	T	0.5792	1.0258	53.3N	134.1E	54	108	02m02s
09506	-19	1999 Aug 11	11:04:09	64	-5	T	0.5062	1.0286	45.1N	24.3E	59	112	02m23s
09546	-18	2017 Aug 21	18:26:40	70	218	T	0.4367	1.0306	37.0N	87.7W	64	115	02m40s
09586	-17	2035 Sep 02	01:56:46	81	441	T	0.3727	1.0320	29.1N	158.0E	68	116	02m54s
09626	-16	2053 Sep 12	09:34:09	100	664	T	0.3140	1.0328	21.5N	41.7E	72	116	03m04s
09668	-15	2071 Sep 23	17:20:28	139	887	T	0.2620	1.0333	14.2N	76.7W	75	116	03m11s
09709	-14	2089 Oct 04	01:15:23	179	1110	T	0.2167	1.0333	7.4N	162.8E	77	115	03m14s

Eclipses of Saros 145

Images courtesy of NASA

For more on this subject, Wikipedia has an excellent write up.

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

08. ASTRONOMY EVENTS

SAN FRANCISCO AMATEUR ASTRONOMERS EVENTS
FEBRUARY 1, 2017 – MARCH 31, 2017

Saturday February 11, 6:00 pm
City Star Party, Presidio Parade Grounds

Tuesday February 21, 7:00 pm – 9:30 pm
Meeting and Lecture, Presidio Officers' Club

Saturday February 25, 6:00 pm
Mt. Tam Members Night

Saturday March 11, 6:30 pm
City Star Party, Point Lobos, San Francisco, CA

Tuesday March 21, 7:00 pm – 7:45 pm
"Ancient Skies, Ancient Trees" (see Section 4)
Special Presentation Prior to Lecture and Book Signing, Presidio Officers' Club

Tuesday March 21, 7:45 pm – 9:30 pm
Meeting and Lecture, Presidio Officers' Club

Saturday, March 25, 6:00 pm
Mt. Tam Members-only Observing Night: Messier Marathon

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

*** * * 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!

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

09.

SFAA EXPEDITION 2017

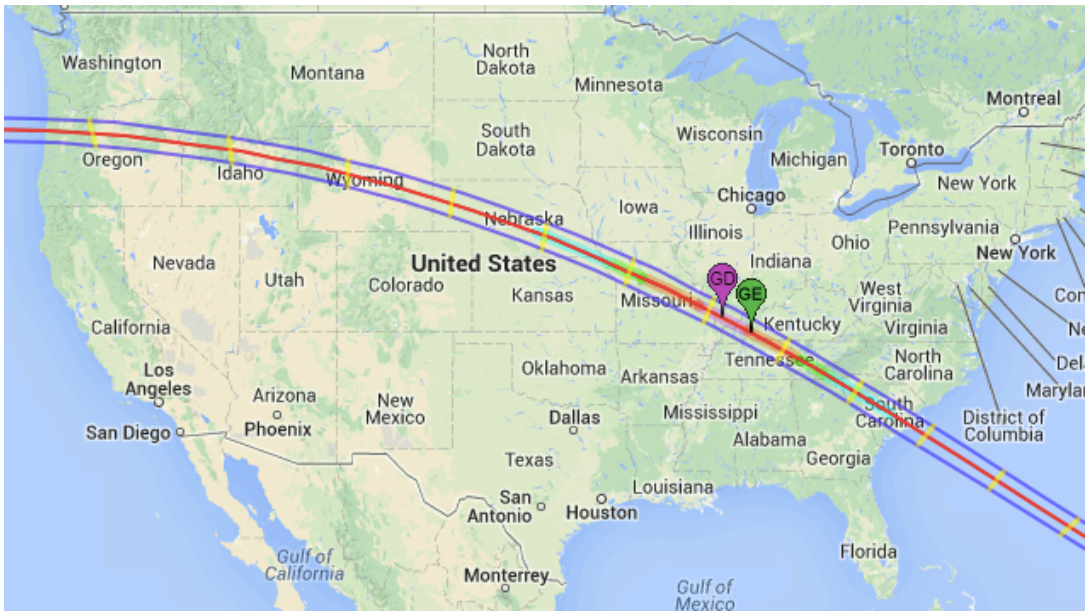
TOTAL SOLAR ECLIPSE
August 21, 2017

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.



10.

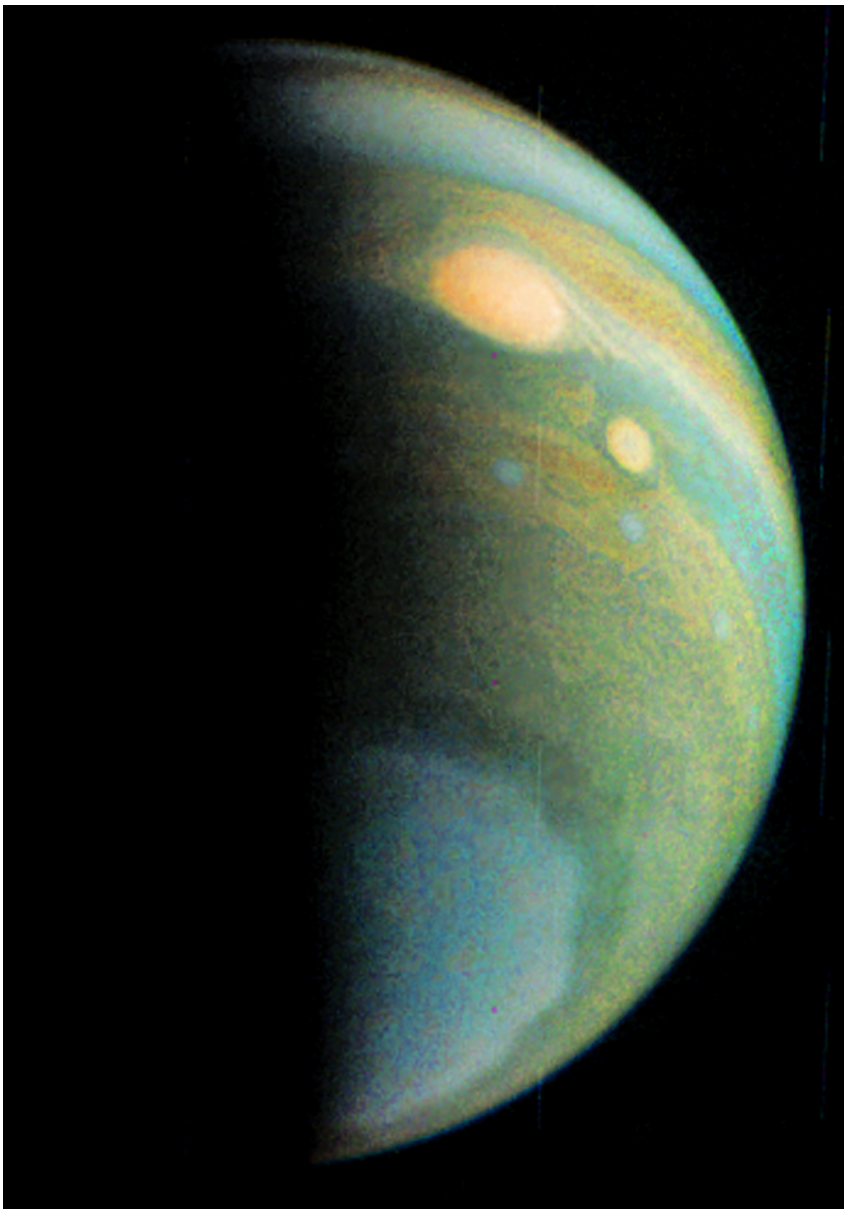
NASA JPL SCIENCE NEWS | February 1, 2017

IT'S NEVER 'GROUNDHOG DAY' AT JUPITER

NASA Juno to Fly By Gas Giant Thursday

NASA's Juno spacecraft will make its fourth flyby over Jupiter's mysterious cloud tops on Thursday, Feb. 2, at 4:57 a.m. PST (7:57 a.m. EST, 12:57 UTC).

At the time of closest approach (called perijove), Juno will be about 2,670 miles (4,300 kilometers) above the planet's cloud tops and traveling at a speed of about 129,000 mph (57.8 kilometers per second) relative to the gas giant. All of Juno's eight science instruments, including the Jovian Infrared Auroral Mapper (JIRAM) instrument, will be on and collecting data during the flyby.



This false color view of Jupiter's polar haze was created by citizen scientist Gerald Eichstädt, using data from the JunoCam instrument on NASA's Juno spacecraft.

The image was taken on Dec. 11, 2016 at 2:30 p.m. PST (5:30 p.m. EST), when the spacecraft was 285,000 miles (459,000 kilometers) from Jupiter on the outbound leg of its third close flyby. This image is composited from four images taken through different filters: red, green, blue and methane.

When the near-infrared methane image is processed with the others, the result is a false color product that highlights high clouds and high altitude hazes. The Great Red Spot and Oval BA (just below the Great Red Spot) are high in Jupiter's atmosphere, thus bright in this picture. The high-altitude haze layer over the south pole partially obscures our view of the storms below. By combining the methane data with the visible light images, we can learn about the vertical structure of Jupiter's atmosphere.

JunoCam's raw images are available at www.missionjuno.swri.edu/junocam for the public to peruse and process into image products.

"Tomorrow may be 'Groundhog Day' here on Earth, but it's never Groundhog Day when you are flying past Jupiter," said Scott Bolton, principal investigator of Juno from the Southwest Research Institute in San Antonio. "With every close flyby we are finding something new."

The Juno science team continues to analyze returns from previous flybys. Revelations include that Jupiter's magnetic fields and aurora are bigger and more powerful than originally thought and that the belts and zones that give the gas giant's cloud top its distinctive look extend deep into the planet's interior. Peer-reviewed papers with more in-depth science results from Juno's first three flybys are expected to be published within the next few months. Also, JunoCam, the first interplanetary outreach camera, is now being guided with the assistance from the public -- people can participate by voting for what features on Jupiter should be imaged during each flyby.

Information about JunoCam voting is available at:

http://www.jpl.nasa.gov/news/news.php?feature=6722

Juno is currently in a 53-day orbit period around Jupiter as the team evaluates options for performing a maneuver to get the spacecraft into a shorter orbit period. While the initial plan was for the mission was to have 14-day orbits during this time, Juno can reveal amazing details about Jupiter even if it stays in the longer orbits for the duration of the mission.

Juno launched on Aug. 5, 2011, from Cape Canaveral, Florida, and arrived at Jupiter on July 4, 2016. During its mission of exploration, Juno soars low over the planet's cloud tops -- as close as about 2,600 miles (4,100 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.

NASA's Jet Propulsion Laboratory, Pasadena, California, manages the Juno mission for the principal investigator, Scott Bolton, of Southwest Research Institute in San Antonio. 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, California.

More information on the Juno mission is available at:

http://www.nasa.gov/juno

http://missionjuno.org

News Media Contact
DC Agle
Jet Propulsion Laboratory, Pasadena, Calif.
818-354-5011
agle@jpl.nasa.gov

Dwayne Brown / Laurie Cantillo
NASA Headquarters, Washington
202-358-1077 / 202-358-1726
dwayne.c.brown@nasa.gov / laura.l.cantillo@nasa.gov

San Francisco Amateur Astronomers
PO Box 15097
San Francisco, CA 94115

San Francisco Amateur Astronomers
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.

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
*SFAA is a 501(c)(3) nonprofit organization. Membership dues are tax-deductible as allowed by law.

□ Please mail to me a Mt. Tamalpais Parking Permit

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

New members will be entered onto the SFAA roster on the Night Sky Network (NSN) and will receive a verifying email from the NSN with username and password for the NSN. Renewing members will have their information updated but will not receive an email from the NSN. Both new and renewing members will receive a verifying email from the SFAA Treasurer upon completion of the membership process.