

ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

Vol. 59, No. 9 – September 2011

Wednesday, September 21, 2011 – General Meeting

Randall Museum . 199 Museum Way . San Francisco

7:00 pm Doors Open . 7:30 pm Announcements . 8:00 pm Speaker

SFAA's General Meetings take place on the 3rd Wednesday of each month (except January)

Pascal Lee, Ph.D.

Chairman, The Mars Institute - Planetary Scientist, SETI, NASA-Ames



Join planetary scientist Dr. Pascal Lee for an evening adventure in the High Arctic to learn about cutting edge Mars exploration technology and science.

The Haughton impact crater site on Devon Island, High Arctic, is one of the most Mars-like places on Earth. Since 1997, the Haughton-Mars Project (HMP) has been conducting science and exploration research at the site, and established the HMP Research Station, now the largest privately operated polar research station in the world. Geology and astrobiology investigations have led to the formulation of the "Mars, Always Cold, Sometimes Wet" Model.

Dr. Lee will take us on a journey to visit Haughton Crater and the HMP Research Station, describe how Haughton is being used to conduct exploration investigations and develop technologies which are helping pave the way towards the first human mission to Mars. He will describe the "Always Cold, Sometimes Wet" Mars model, and show the evidence from earth and Mars supporting this model. He will also describe a possible timeline for manned missions to Mars and nearby objects.

Dr. Pascal Lee is co-founder and chairman of the [Mars Institute](#), a planetary scientist at the [SETI Institute](#) in Mountain View, CA, and the Principal Investigator of the NASA [Haughton-Mars Project \(HMP\)](#) at [NASA Ames Research Center](#) in Moffett Field, CA. He holds an Ingénieur degree (ME) in Engineering Geology & Geophysics from the University of Paris (1987), and a MS (1993) and Ph.D. (1997) in Astronomy & Space Sciences from Cornell University. Dr. Lee's research interests focus on Mars, asteroids and impact craters. He is particularly interested in the history of water on Mars and in the geologic and physical conditions allowing life to develop on planets. Dr. Lee often visits the Earth's polar regions and other extreme environments for planetary analog studies.

May 16, 2010 - An international team of researchers led by Mars Institute scientist Dr. Pascal Lee successfully reached Devon Island, High Arctic, on Sunday, 16 May, 2010 after a 13-day, 150 km vehicular journey from Cornwallis Island to Devon Island, along the fabled Northwest Passage.

"A human mission to Mars is an expedition. As with any expedition, its success depends



PRESIDENT'S MESSAGE

The San Francisco Amateur Astronomers is actively engaged with a number of organizations in the Bay Area, partnering to facilitate public telescope viewing in the hope we can 'light the fire' of astronomy in the minds of more people.

We had a wonderful public viewing as we supported the **Mt Tam Astronomy Program** early September. There was a wonderful crowd of 200 or so members of the public who enjoyed a talk and then spent an hour or so viewing through scopes – about a dozen of our members came out to represent the club.

I get a particular kick out of showing the wonders of, say, the Andromeda Galaxy to people who have just had their perspectives stretched by an amazing talk about cosmology. If this is also your 'cup of tea' as we say in Australia, come with your scope and join us up at the Rock Springs parking lot on October 1st. (As an added inducement, generally we have brownies or cake on hand. Something about all that sugar helps refine our astronomy techniques immensely!)

Another big public outreach event we're holding is on **September 29th at the Dominican University**. We'll be providing volunteers and their scopes to help lead first year students through the wonders of the universe as part of their 'Big History' course. Please email me at sfaapresident@gmail.com or via my link on the website if you are able to attend. Hope to see you at one of these events, or at our General Meeting on Wednesday 21st September.

SUE-ELLEN SPEIGHT
President
San Francisco Amateur Astronomers



San Francisco Amateur Astronomers

Upcoming Lectures and Lecturers

Randall Museum Theater . Randall Museum
199 Museum Way
San Francisco

7:30 p.m. . Free & Open to the Public



October 19 – CATCHING SHADOWS: KEPLER'S QUEST FOR NEW WORLDS

Dr. Natalie Batalha – Assistant Professor, Physics and Astronomy, San Jose State University

Dr. Batalha has been affiliated with NASA Ames Research Center since 2000 where she conducts research on extrasolar planet detection and stellar astrophysics. She is a co-Investigator for NASA's Kepler Mission whose objective is to identify and characterize habitable, earth-like planets orbiting sun-like stars. As Director of the Systems Teaching Institute at the NASA Research Park (<http://uarc.ucsc.edu/sti>), Dr. Batalha is responsible for creating programs and resources for students pursuing careers in fields relevant to the mission of NASA Ames Research Center.



November 16 -- PSYCHOLOGICAL ISSUES AFFECTING ASTRONAUTS IN SPACE

Dr. Nick Kanas - Emeritus Professor of Psychiatry, University of California, San Francisco

A number of psychiatric and interpersonal issues can affect astronauts in space. Professor Nick Kanas will review important psychosocial issues, describe his research with astronauts and cosmonauts who have flown on the Mir and International Space Stations, and discuss countermeasures that will improve the psychological well-being of future space travelers.



December 21 -- Erick Young, SOFIA Science Mission and Operations Director

Erick Young, a widely recognized authority on infrared astronomy, is Science Mission Operations Director for SOFIA. Most recently, Young was responsible for developing the far-infrared detector arrays on the Spitzer Space Telescope's Multiband Imaging Photometer for Spitzer (MIPS). The instrument provided both imaging and spectroscopic data at far-infrared wavelengths.

IMPORTANT DATES

SFAA GENERAL MEETINGS & LECTURES

Randall Museum, 199 Museum Way (Near 14th Street and Roosevelt)

Third Wednesday of each month: 7:00 p.m. Doors open. 7:30 p.m. Announcements. 8:00 p.m. Speaker

SFAA BOARD MEETINGS IMMEDIATELY PRECEDE GENERAL MEETINGS AND BEGIN AT 6:00 P.M.

September 21
October 19

November 16
December 21

CITY STAR PARTIES *Land's End (Point Lobos)*

The parking lot at Lands End is currently under construction and will be inaccessible for a few months. SFAA Public Star Party will be held at the multi-tiered parking lot just past the entrance of land's end on Geary Street. We believe the address for this parking lot is 1 Merry Way.

Directions:

If you are heading west on Geary (toward the Ocean), the entrance will be on your right a few hundred feet after the Lands End turn off. It is located above the Cliff House Restaurant.

Map and directions: <http://www.sfaa-astronomy.org/clubarchive/directions-pointlobos.php>

TELESCOPE CLINIC ONE HOUR BEFORE SUNSET

NOTE: While City Star Parties WILL ALWAYS be held on a Saturday, some will be close to the last quarter phase of the moon; others will be close to first quarter. This is so we can work around dates for Mt. Tam public star parties as well as our Mt. Tam members-only events.

2010 MT TAM SPECIAL USE PERMIT STAR PARTIES - MEMBERS ONLY

GATEKEEPERS NEEDED

Special Use Permit observing nights on Mount Tamalpais are private and open *only* to SFAA members. Please arrive by sunset. A permit is required for each car. We must vacate the mountain by 2:00 a.m. except on specially approved nights (such as Messier Marathon).

September 24
October 22

November 26
December 24

MT TAM PUBLIC STAR PARTIES (May through October)

Public nights on Mount Tamalpais start with a lecture in the Mountain Theatre, followed by public viewing in the Rock Springs parking lot. SFAA members may view privately after crowd departs from approx. 11 pm-2 am.

For more information: <http://www.sfaa-astronomy.org/starparties/>

SFAA OUTREACH EVENT – September 29, 2011, 7:00 p.m.

DOMINICAN UNIVERSITY, 50 Acacia Avenue, San Rafael

We have a big outreach event happening September 29th, 2011 at 7pm at the Dominican University campus in Marin.

Up to 200 students will be attending to look through our club scopes, so we need volunteers who are keen to inspire a young generation of amateur astronomers. Please email me at sfaapresident@gmail.com if you are interested in helping us with this event.

Location: Multi-Use Field behind the Conlan Sports Center: see this map (field is located just above the blue pool in the center left. <http://www.dominican.edu/about/campus/mapsandparking.html>)

Parking: park in slots reserved for us in the Conlan Sports Center. These will be as close as possible to the sports field entrance. There will be trolleys to help move the equipment the 100yds from the parking lot to the sports field.

Timing: Sunset is 6.58pm. I plan to arrive at 6.15ish to set up and handle logistics. If you can be setting up by 6.30 that should give ample time, before twilight and allow us to have some dinner (I will bring cake!!). Students will arrive from 8pm onward.

Who is the Audience?: The course has 270 students. We were told to expect between 150 - 200 students. Most will be first years though some older students may stumble into the program. About a dozen professors will also attend.

Format: The club will set up various scopes as 'stations' that the students can visit. Each scope ideally will focus on a different object, and we'll have one or two people identifying Constellations as well. We will provide a couple of science 'kits' that cover some of the latest NASA experiments like Kepler and astrobiology for example, set up on tables. We need to 'man' those stations, hence the need for volunteers.

Scopes needed: We need to field at least 10 scopes, including some binocs if possible. Ideally we'll have over

10 astronomers from the club ... said cake is an inducement!

Object Viewing Lists: The lecturers haven't provided any viewing 'must haves', and the SFAA is responsible for finding all the 'cool stuff' to talk about. So, we'll come up with our own observing lists for the night. (your input is gratefully received!!!) I will research and circulate some ideas.

The professors have indicated the students are fascinated by deep sky objects - particularly the idea that the light from these objects has been travelling for a long time, so if we can find galaxies, nebulae etc.. that is perfect. Big ideas like supernovae being the 'birthplace' of everything, even us...is central to the course.

The course also covers mythology and ancient history, and how past civilizations have interpreted the sky. So planets and their moons with mythic names (Jupiter may be visible on the evening) will be interesting.

Contacts: Best to coordinate most of your questions through me however, so we avoid asking duplicate questions of her. My cell is 415 450 7173.

On the day if you can't reach me, Jaime Castner is our contact from Dominican. She is very helpful as a coordinator, and her info is:

Jaime Castner
Assistant to the Director of General Education and FYE
Dominican University of California
50 Acacia Avenue, San Rafael, Ca 94901
Office: Angelico 223 Phone: 415-257-1300
email: jaime.castner@dominican.edu

Please let me know if you are able to generously contribute your time and wisdom to this great event. I'm hoping we can inspire the next generation of astronomers, amateur and professional!

E-mail me to let me know if you can commit to the event: sfaapresident@gmail.com.

Sue-Ellen Speight
President

San Francisco Amateur Astronomers . Exploring the Night Skies Since 1952

For Sale: \$300



Orion Apex Maksutov-Cassegrain Apex 127mm Tube Telescope
Orion SkyView Delux Equatorial Mount
Rarely used and handled with care, so it is in very good condition.

Hi,

My name is Lorrie Boen. I have been a member of San Francisco Amateur Astronomers for many years. Over several of those years, I served multi-year terms as Treasurer, board member and newsletter editor.

I am leaving the country and reluctantly need to give up my telescope. While the mount is not the one shown on the Orion website for this telescope, the O-rings included allow for a very stable and safe attachment to the equatorial mount.

Includes:

Carrying case (soft) for telescope	Shorty 2x Barlow 1.25"
O-Rings for attaching telescope tube to mount	Erecting prism - 45°
Orion 6x26 Correct Image spotting scope	Sirius Plossl 12.5mm eyepiece
Polar Scope	Sirius Plossl 25 mm eyepiece
Solar Filter – Astroview 120	Tools needed for assembly
Orion 1.25" var. polarizing filter - 1%-40% Transmission	Manuals for telescope & mount.

Please email me if you are interested – lorrenlee@aol.com



**2011 Mt Tam Astronomy Programs
Mt. Tamalpais State Park –
Cushing Memorial Theatre
(aka the Mountain Theatre)**

**EXPLORE THE WONDERS OF THE UNIVERSE
23rd series of lectures + star parties on Mt Tam.**

Talk takes place in the Cushing Memorial Theatre (usually just called the Mountain Theatre) and is followed by observing in the Rock Spring Parking Lot. This program is sponsored by your state park and is FREE and open to the public. Bring your neighbors and friends. Encourage young people to come and introduce them to the experience of learning some science in a friendly setting followed by a chance to view through telescopes provided by the San Francisco Amateur Astronomers.

If you know others who may wish to receive notices of our programs, send e-mail addresses to tinkaross@comcast.net. Or send a reply to this notice if you wish to be removed from this list. Reminder notices are sent the week prior to each event and emails are not shared with anyone else.

You can learn more about our programs by checking our web site: www.mttam.net or by calling our hot line: 415-455-5370. If you still have questions or comments contact Tinka at 415-244-4715.

Come join us on the Mountain!

Oct 17
7:30pm

Dr. Anne Metevier, UC Santa Cruz/Sonoma State University
“Milky Way Galaxies Across the Universe”

The universe contains many vast galaxies containing stars, gas and dust.
What do we know about the formation and evolution of galaxies most like
our own Milky Way.

Thank you for sharing this information with others.

Looking for a flashlight for the mountain? Check out Visionaryflashlights.com. Use the code astro for a 15% discount

NIGHT SKY NETWORK

The Evening Sky Map

September Evening Sky Map: <http://www.skymaps.com/skymaps/tesmn1109.pdf>

Sky Calendar -- September 2011: <http://www.skymaps.com/articles/n1109.html>

BAY AREA ASTRONOMY EVENTS – Kenneth Lum

The busy summer break is over for many of our regular events and they are returning with a huge gaggle of new and interesting events. Just look at what is coming up!

<p>Friday, 9/16 9PM – 11:00PM Open for public viewing every clear Friday evening</p> <p>Foothill Observatory Foothill Community College 12345 Moody Road Los Altos Hills</p>	<p>COME TO Foothill Observatory and join us in the exploration of our universe!</p> <p>Visitors can view the wonders of the universe through the observatory's new computer-controlled 16-inch Schmidt-Cassegrain telescope. Views of objects in our solar system may include craters and mountains on the moon, the moons and cloud-bands of Jupiter, the rings of Saturn, etc. The choice of targets for any evening's viewing depends on the season and what objects are currently in the sky.</p> <p>On clear, dark, moonless nights, the telescopes give visitors views into the deeper reaches of space. Star clusters, nebulae, and distant galaxies provide dramatic demonstrations of the vastness of the cosmos.</p> <p>The public viewing programs at Foothill are free of charge and are open to guests of all ages. Please note that the observatory is closed when the weather is cloudy. Also note that visitor parking permits are available from the machines in the parking lots for \$2.00.</p> <p>Foothill Observatory is located on the campus of Foothill College in Los Altos Hills, CA. Take Highway 280 to the El Monte Rd exit. The observatory is next to parking lot 4. Parking at the college requires visitor parking permits that are available from the machines in the parking lots for \$2.00.</p>
<p>Friday, 9/16 7:00 PM</p> <p>Chabot Space and Science Center 10000 Skyline Boulevard Oakland CA 94619-2450 (510) 336-7300</p>	<p>The Telescope Makers' Workshop is held every Friday night from 7pm - 10pm, excluding major holidays (e.g. Christmas Day and New Year's Day) that fall on Fridays. The Workshop is always closed on Memorial Day Weekend. Attendance every Friday night is not mandatory, and members work at their own pace. The Workshop meets at Chabot Space & Science Center, 10000 Skyline Blvd., Oakland. Contact us for more specific details: E-mail Richard Ozer (rozer@pacbell.net) or (510) 406-1914.</p>
<p>Saturday, 9/17 11:00 AM – 12:00 Noon</p> <p>UC Berkeley Genetics & Plant Biology Building Berkeley CA 94720</p>	<p>Speaker: MEREDITH HUGHES HOW TO BUILD A PLANET</p> <p>The discovery of extrasolar planetary systems has overturned entrenched ideas about how our own planetary system formed. Around other stars we find exotic planets like nothing we see around our Sun: hot Jupiters, super-Earths, and massive planets at Kuiper Belt distances and beyond. Where do they come from, and can we devise a story of planet formation that can account for the wide diversity of systems we see around our own star and others? This talk will introduce you to some of the ways we learn about planet formation, starting with evidence from observations with the naked</p>

<p>Cost: FREE</p>	<p>eye and small telescopes and proceeding to the latest in high-resolution optical, infrared, and radio telescope observations of the disks of gas and dust around young stars. We will explore the main theories and open questions about how planets form in circumstellar disks, and attempt to place our solar system in context: are we normal?</p>
<p>Saturday, 09/17 8:00 PM - 10:00 PM</p> <p>Lawrence Hall of Science 1 Centennial Drive Berkeley, CA 94720</p> <p>Phone: 510-642-5132</p> <p>Cost: FREE</p>	<p style="text-align: center;">SATURDAY NIGHT STARGAZING See the Moon, Planets, Stars, Galaxies and More</p> <ul style="list-style-type: none"> * Stargaze through astronomical telescopes * Ask questions and talk with amateur astronomers * Learn how to use a star map to find constellations * Share in the wonder of the universe with your friends <p>Stargazing is always weather permitting-be sure to dress warmly. Foggy and overcast skies can cancel stargazing at the last minute.</p>
<p>Friday, 9/16 and Saturday, 9/17</p> <p>Chabot Space and Science Center 10000 Skyline Boulevard Oakland CA 94619-2450 (510) 336-7300</p>	<p style="text-align: center;">EXPLORE THE NIGHT SKIES AT CHABOT OBSERVATORIES For more information: http://www.chabotspace.org/</p> <p style="text-align: center;">FREE TELESCOPE VIEWING Regular hours: 7:30pm -10:30pm Every Friday & Saturday evening, <u>weather permitting</u>.</p> <p style="text-align: center;">Come for spectacular night sky viewing the best kept secret in the Bay Area and see the magnificence of our telescopes in action!</p> <p style="text-align: center;">DAYTIME TELESCOPE VIEWING Observatories Open 12pm - 5pm, <u>weather permitting</u>. Come view the sun, moon, or Venus through Chabot's telescopes. Free with General Admission.</p>
<p>Friday, 9/16 and Saturday, 9/17</p> <p>Chabot Space and Science Center 10000 Skyline Boulevard Oakland CA 94619-2450 (510) 336-7300</p>	<p style="text-align: center;">SKIES! 6:00 PM DINNER, A MOVIE, AND THE UNIVERSE</p> <p>Join us for Chabot's unique evening social rendezvous. Start your night off with dinner and drinks, then cozy up in the planetarium as you're whisked to the edge of the universe and cap off the evening with telescope viewing featuring breathtaking views of the cosmos.</p> <p style="text-align: center;">ADVANCE TICKETS</p> <p>DINNER: Buy advance tickets to ensure your dinner reservation. Purchase dinner separately at the cafe (\$15).</p> <p>A MOVIE AND THE UNIVERSE: Admission to Chabot includes access to all of our interactive exhibitions, a film in the MegaDome theater AND a show in the Digital Planetarium.</p> <p style="text-align: center;">Purchase your advance tickets online or call the Box Office at (510) 336-7373.</p>
<p>Friday, 9/16 9PM – 11:00PM Open for public viewing every clear Friday evening</p> <p>Foothill Observatory Foothill Community College</p>	<p>COME TO FOOTHILL OBSERVATORY AND JOIN US IN THE EXPLORATION OF OUR UNIVERSE!</p> <p>Visitors can view the wonders of the universe through the observatory's new computer-controlled 16- inch Schmidt-Cassegrain telescope. Views of objects in our solar system may include craters and mountains on the moon, the moons and cloud-bands of Jupiter, the rings of Saturn, etc. The choice of targets for any evening's viewing depends on the season and what objects are currently in the sky.</p>

<p>12345 Moody Road Los Altos Hills</p>	<p>On clear, dark, moonless nights, the telescopes give visitors views into the deeper reaches of space. Star clusters, nebulae, and distant galaxies provide dramatic demonstrations of the vastness of the cosmos.</p> <p>The public viewing programs at Foothill are free of charge and are open to guests of all ages. Please note that the observatory is closed when the weather is cloudy. Also note that visitor parking permits are available from the machines in the parking lots for \$2.00.</p> <p>Foothill Observatory is located on the campus of Foothill College in Los Altos Hills, CA. Take Highway 280 to the El Monte Rd exit. The observatory is next to parking lot 4. Parking at the college requires visitor parking permits that are available from the machines in the parking lots for \$2.00.</p>
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<p>Friday, 9/16 8:00 PM</p> <p>Town Center Portola Road Portola Valley</p>	<p>PORTOLA VALLEY STAR PARTY – Volunteers Wanted</p> <p>We are looking for volunteers to set up scopes. We're also doing a workshop for people who own telescopes and have been frustrated in trying to use them. The concept is that if someone brings in their rig and gets five minutes with an experienced person to talk about eyepieces, appropriate targets, finderscope options, or how to navigate their scope it would do wonders in many cases.</p> <p>Please contact me if interested in helping –</p> <p style="text-align: center;">Andrew Pierce - Pierce & Shearer LLP 2200 Geng Road, Suite 230, Palo Alto, CA 94303 (650) 843-1900 apierce@pierceshearer.com</p>

<p>Saturday, 9/17 10:00 AM – 12:00 Noon IF IT IS CLEAR</p> <p>Foothill Observatory Foothill Community College 12345 Moody Road Los Altos Hills</p> <p>Admission: FREE</p>	<p>Solar observing with a Hydrogen alpha solar telescope every clear Saturday morning. This allows spectacular views of solar prominences and unusual surface features on the Sun not otherwise visible with regular white light telescopes.</p> <p>Foothill Observatory is located on the campus of Foothill College in Los Altos Hills, CA. Take Highway 280 to the El Monte Rd. exit. The observatory is next to Parking Lot 4. Parking at the college requires visitor parking permits that are available from the machines in the parking lots for \$ 2.00.</p>
<p>Wednesday, 9/21 9:30 AM – 5:00 PM</p> <p>California Academy of Sciences 55 Music Concourse Drive San Francisco CA 94118</p> <p>Admission: FREE</p>	<p>FREE WEDNESDAY AT CAL ACADEMY</p> <p>Free admission is available to visitors on the third Wednesday of every month, through the generosity of The Bernard Osher Foundation. Admission is on a first come, first served basis, and early arrival is recommended due to the likelihood of high demand. Also, please note that final entry to the museum on free days is 4pm and, finally, that there will be no members-only entrance on Free Wednesdays.</p>
<p>Wednesday, 9/21 7:00 PM</p> <p>SETI Institute Colloquium Series 189 Bernardo Avenue Mountain View CA 94043</p>	<p>SPACE X AND THE DRAGON SPACECRAFT Abhishek Tripathi SpaceX Inc.</p> <p>With the retirement of the Space Shuttle this past summer the United States entered a new era, one in which U.S. astronauts will be flying only aboard the Russian Soyuz vehicle in order to access Low Earth Orbit and the International Space Station. California headquartered Space Exploration Technologies (SpaceX) has developed and twice launched a brand new launch vehicle (Falcon9), as well as launched and recovered a space capsule designed for humans (Dragon). SpaceX will soon begin delivering cargo, and ultimately plans on launching crew, to the International Space Station from U.S. soil. And all that is just the beginning of what SpaceX has in mind to revolutionize human access into Space.</p>
<p>Thursday, 9/22 4:00 PM</p> <p>Lockheed Martin ATC Auditorium Building 202 3251 Hanover Street Palo Alto CA 94304</p>	<p>THE EXPLORER 1 ANOMOLY DR. DAVID LEVINSON, Lockheed Martin Advanced Technology Center</p> <p>On January 31, 1958, NASA successfully launched America's first satellite, Explorer I, into orbit around the Earth. As is well known, not only did this achieve the political goal of putting the United States back in the space race it was losing badly to the Soviet Union, but instruments onboard Explorer I sent back the first data revealing the existence of the Van Allen radiation belts – a major scientific triumph. What is not so well known is that Explorer I also made its mark in aerospace engineering lore by exhibiting an attitude motion anomaly that none of the extensive published literature from the previous two centuries of research on rigid body dynamics had accounted for.</p> <p>During this talk, the anomaly will be described in detail, and, through the use of modern-day dynamics simulation tools, including animation, the principles of mechanics underlying what happened will be discussed in terms suitable for a general audience. The consequences for later spacecraft design from what was learned from the Explorer I anomaly will be explained.</p> <p>Mr. Levinson is a senior staff research engineer at the Lockheed Martin Advanced Technology Center, specializing in the kinematics and dynamics of complex systems of interconnected rigid bodies. He holds a bachelor's degree in engineering from Cornell</p>

	<p>University, with a concentration in space mechanics, and a master's and an engineer's degree from Stanford University, both in applied mechanics.</p>
<p>Thursday, 9/22 4:00 PM</p> <p>UC Berkeley 141 McCone Hall</p>	<p>SEAN SOLOMON, DTM EXPLORING THE PLANET MERCURY WITH THE MESSANGER SPACECRAFT Sponsored by UC Berkeley, Department of Astronomy</p> <p>One of Earth's closest planetary neighbors, Mercury remained comparatively unexplored for the more than three decades that followed the three flybys of the innermost planet by the Mariner 10 spacecraft in 1974–75. Mariner 10 imaged 45% of Mercury's surface at about 1 km/pixel average resolution, confirmed Mercury's anomalously high bulk density and implied large fractional core size, discovered Mercury's internal magnetic field, documented that H and He are present in the planet's tenuous exosphere, and made the first exploration of Mercury's magnetosphere and solar wind environment. Ground-based astronomers later reported Na, K, and Ca in Mercury's exosphere; the presence of deposits in the floors of polar craters having radar characteristics best matched by water ice; and strong evidence from the planet's forced libration amplitude that Mercury has a fluid outer core. Spacecraft exploration of Mercury resumed with the selection for flight, under NASA's Discovery Program, of the MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) mission. Launched in 2004, MESSENGER flew by the innermost planet three times in 2008-2009 en route to becoming the first spacecraft to orbit Mercury in March of this year. MESSENGER's first chemical remote sensing measurements of Mercury's surface indicate that the planet's bulk silicate fraction differs from those of the other inner planets, with a low-Fe surface composition intermediate between basalts and ultramafic rocks and best matched among terrestrial rocks by komatiites. Moreover, surface materials are richer in the volatile constituents S and K than predicted by most planetary formation models. Global image mosaics and targeted high-resolution images (to resolutions of 10 m/pixel) reveal that Mercury experienced globally extensive volcanism, including large expanses of plains emplaced as flood lavas and widespread examples of pyroclastic deposits likely emplaced during explosive eruptions of volatile-bearing magmas. Bright deposits within impact craters host fresh-appearing, rimless depressions or hollows, often displaying high-reflectance interiors and halos and likely formed through processes involving the geologically recent loss of volatiles. The tectonic history of Mercury, although dominated by near-global contractional deformation as first seen by Mariner 10, is more complex than first appreciated, with numerous examples of extensional deformation that accompanied impact crater and basin modification. Mercury's magnetic field is dominantly dipolar, but the field is axially symmetric and equatorially asymmetric, a geometry that poses challenges to dynamo models for field generation. The interaction between the solar wind and Mercury's magnetosphere, among the most dynamic in the solar system, serves both to replenish the exosphere and space weather the planet's surface. Plasma ions of planetary origin are seen throughout the sampled volume of Mercury's magnetosphere, with maxima in heavy-ion fluxes in the planet's magnetic-cusp regions. Bursts of energetic electrons, seen at most local times, point to an efficient acceleration mechanism operating within Mercury's magnetosphere on a regular basis that produces electrons with energies up to hundreds of keV on timescales of seconds.</p>

<p>Thursday, 9/22 7:30 PM</p> <p>Randall Museum Theater 199 Museum Way San Francisco CA 94114</p> <p>Admission: \$5 donation suggested</p>	<p>STANLEY KLEIN, Professor of Vision Science, UC Berkeley ASK A SCIENTIST: DOES THE WIERDNESS OF QUANTUM PHYSICS INFLUENCE THE BRAIN?</p> <p>Neuroscientists say that there is a mystery at the core of our understanding of consciousness. Physicists say that there is a mystery at the core of our understanding of quantum mechanics. Do these two mysteries have anything to do with each other? UC Berkeley physicist Stan Klein, a founding member of the Association for the Scientific Study of Consciousness, will help us to get a good scientific handle on this thorny, important, and controversial topic. Find out what Dr. Klein has to say about the role of "quantum weirdness" as it relates to the awesome capabilities of the brain, personal awareness, free will, and even parapsychology.</p>
<p>Friday, 9/23 7:00 PM – 10:00 PM</p> <p>Chabot Space and Science Center 10000 Skyline Boulevard Oakland CA 94619-2450</p>	<p>THE TELESCOPE MAKERS' WORKSHOP</p> <p>The Telescope Makers' Workshop is held every Friday night from 7pm - 10pm, excluding major holidays (e.g. Christmas Day and New Year's Day) that fall on Fridays. The Workshop is always closed on Memorial Day Weekend. Attendance every Friday night is not mandatory, and members work at their own pace. The Workshop meets at Chabot Space & Science Center, 10000 Skyline Blvd., Oakland. Contact us for more specific details: Contact: E-mail Richard Ozer (rozer@pacbell.net) or (510) 406-1914</p>
<p>Friday, 9/23 7:00 PM</p> <p>Houge Park San Jose CA</p>	<p>SAN JOSE ASTRONOMICAL ASSOCIATION PUBLIC STAR PARTY, 8:00 – 11:00 P.M.</p> <p>Beginning Astronomy Class Deep Sky Observing</p> <p>In the hall at Houge Park</p>
<p>Friday, 09/23 6:00 PM - 10:00 PM</p> <p>Chabot Space and Science Center 10000 Skyline Blvd Oakland, CA 94619 USA</p> <p>Cost: FREE With Admission</p>	<p>NEPTUNE NIGHT</p> <p>Getting the blues never felt so good. Mark the anniversary of Neptune's first solar orbit since its discovery. This blue-themed event will be fun for all ages as visitors enjoy hands-on activities, point telescopes to the sky for some nighttime viewing and engage in conversations about the blue planet.</p>
<p>Saturday, 9/24 7:03 PM, Sunset</p> <p>Crestview Park</p>	<p>SAN MATEO COUNTY ASTRONOMICAL SOCIETY STAR PARTY Star Parties at Crestview Park</p> <p>Come out and bring the kids for a mind expanding look at the universe</p>

<p>San Carlos</p>	<p>The City of San Carlos Parks and Recreation Department and the San Mateo County Astronomical Society has open Star Parties twice a month. These events are held in Crestview Park, San Carlos California.</p> <p>Note that inclement weather (clouds, excessive wind and showers) will cause the event to be canceled without notice.</p> <p>For more information call Bob Black, (650)592-2166, or send an email to SMCAS@live.com or call Ed Pieret at (650)862-9602.</p> <p>Reasons to Attend If you have kids interested in space or planets bring them here for a real life view of planets, nebula, star clusters and galaxies. If you are thinking of buying a telescope or want help using a telescope you own, come here to talk with experienced users. If you think you might have an interest in astronomy come and talk to experienced amateur astronomers.</p> <p>Cautions Dress warmly and wear a hat. Visitors should park on the street and walk into the park so your headlights don't affect the observer's dark adaptation. Only park in the parking lot if you are arriving before dark and plan to stay until the end of the event. You shouldn't need lights but if you feel you do, only bring a small flashlight with the lens covered using red cellophane or red balloon. Please respect the telescopes and ask permission from the owner if you wish to touch. Parents, please watch your children. The park is residential, and adjacent to homes and backyards, please keep noise to a minimum.</p> <p>Astronomers arrive to set up at around sunset. Observing starts at about one hour after sunset and continues for two to three hours.</p>
<p>Saturday, 9/24 3:00 PM</p> <p>Almaden Branch Library 6445 Camden Avenue San Jose CA 95120 (408) 808-3040 ab.sjpl@sjlibrary.org</p> <p>Admission: FREE</p>	<p>INTERPLANETARY MISSIONS WITH NASA/JPL SOLAR SYSTEM AMBASSADOR ERIC NORRIS NASA/JPL Solar System Ambassador Eric B. Norris will present an exciting multimedia look at current NASA interplanetary missions, including the Dawn mission to Vesta, the Juno mission to Jupiter, and the soon-to-be-launched Mars Curiosity Rover. Eric will also update us on other missions throughout the solar system from Mercury to Pluto.</p>
<p>Friday, 9/23 and Saturday, 9/24</p> <p>Chabot Space and Science Center 10000 Skyline Boulevard Oakland CA 94619-2450 (510) 336-7300</p>	<p>EXPLORE THE NIGHT SKIES AT CHABOT OBSERVATORIES For more information: http://www.chabotspace.org/</p> <p>FREE TELESCOPE VIEWING Regular hours: 7:30pm -10:30pm Every Friday & Saturday evening, <u>weather permitting</u>. Come for spectacular night sky viewing the best kept secret in the Bay Area and see the magnificence of our telescopes in action! DAYTIME TELESCOPE VIEWING Observatories Open 12pm - 5pm, <u>weather permitting</u>.</p>

	<p>Come view the sun, moon, or Venus through Chabot's telescopes. Free with General Admission.</p>
<p>Friday, 9/23 and Saturday, 9/24</p> <p>Chabot Space and Science Center 10000 Skyline Boulevard Oakland CA 94619-2450 (510) 336-7300</p>	<p>SKIES! 6:00 PM DINNER, A MOVIE, AND THE UNIVERSE Join us for Chabot's unique evening social rendezvous. Start your night off with dinner and drinks, then cozy up in the planetarium as you're whisked to the edge of the universe and cap off the evening with telescope viewing featuring breathtaking views of the cosmos.</p> <p>ADVANCE TICKETS DINNER: Buy advance tickets to ensure your dinner reservation. Purchase dinner separately at the cafe (\$15). A MOVIE AND THE UNIVERSE: Admission to Chabot includes access to all of our interactive exhibitions, a film in the MegaDome theater AND a show in the Digital Planetarium. Purchase your advance tickets online or call the Box Office at (510) 336-7373.</p>
<p>Friday, 9/23 9:00 PM</p> <p>Foothill Observatory Foothill Community College 12345 Moody Road Los Altos Hills</p>	<p>Foothill Observatory is open for public viewing every clear Friday evening from 9:00 p.m. until 11:00 p.m. Visitors can view the wonders of the universe through the observatory's new computer-controlled 16- inch Schmidt-Cassegrain telescope. Views of objects in our solar system may include craters and mountains on the moon, the moons and cloud-bands of Jupiter, the rings of Saturn, etc. The choice of targets for any evening's viewing depends on the season and what objects are currently in the sky.</p> <p>On clear, dark, moonless nights, the telescopes give visitors views into the deeper reaches of space. Star clusters, nebulae, and distant galaxies provide dramatic demonstrations of the vastness of the cosmos.</p> <p>The public viewing programs at Foothill are free of charge and are open to guests of all ages. Please note that the observatory is closed when the weather is cloudy. Also note that visitor parking permits are available from the machines in the parking lots for \$2.00.</p> <p>Come to Foothill Observatory and join us in the exploration of our Universe!</p> <p>Foothill Observatory is located on the campus of Foothill College in Los Altos Hills, CA. Take Highway 280 to the El Monte Rd exit. The observatory is next to parking lot 4. Parking at the college requires visitor parking permits that are available from the machines in the parking lots for \$2.00.</p>
<p>Saturday, 9/24 10:00 AM – 12 Noon IF IT IS CLEAR</p> <p>Foothill Observatory Foothill Community College 12345 Moody Road Los Altos Hills</p>	<p>Solar observing with a Hydrogen alpha solar telescope every clear Saturday morning. This allows spectacular views of solar prominences and unusual surface features on the Sun not otherwise visible with regular white light telescopes. Admission is free.</p> <p>Foothill Observatory is located on the campus of Foothill College in Los Altos Hills, CA. Take Highway 280 to the El Monte Rd. exit. The observatory is next to parking lot 4. Parking at the college requires visitor parking permits that are available from the machines in the parking lots for \$ 2.00.</p>

<p>Tuesday, 9/27 7:30 PM</p> <p>Panofsky Auditorium SLAC National Accelerator Laboratory 2575 Sand Hill Road Menlo Park CA 94025-7015</p>	<p>DEEP SCIENCE: MINING FOR DARK MATTER SUNIL GOLWALA, CALTECH</p> <p>Astronomers infer that the universe contains huge amounts of a mysterious, invisible substance called "dark matter". To account for the structure of galaxies and clusters of galaxies, the universe must contain six times more dark matter than ordinary atomic matter. We do not know what this stuff is made of. It should be composed of particles of some kind, and, if so, we should be able to see those particles streaming in from space. However, the particles must be very weakly interacting, so exotic methods are needed to make them visible. In this lecture, Sunil will present the evidence for dark matter. He will then describe some of the technologies that are now being used to search for dark matter particles. Among these, Sunil will present his own search experiment, one of the world's most sensitive, which uses ultra-pure crystals maintained at cryogenic temperatures in a deep underground laboratory.</p>
<p>Saturday, 9/24 – Saturday, 10/1</p> <p>Barcroft High Altitude Research Station White Mountains</p> <p>Cost: \$68/person/night To purchase days at Barcroft online via PayPal, use these convenient buttons:</p> <p>http://www.eastbayastro.org/index/xtrapages/barcroft.htm</p>	<p>LOW OXYGEN STAR PARTY – BARCROFT RESEARCH STATION</p> <p>Each year, sometime in the late summer, the Eastbay Astronomical Society and the Tri-Valley Stargazers put together a star party that's literally "above the rest!" For as long as a week, you can buy room and board for \$68 per person/night up at the Barcroft High Altitude Research Station, which is at 12,435 feet above sea level (ASL) in the White Mountains, east of the Sierra Nevada mountains. This is the home of the Bristlecone Pines, the World's Oldest Living Things. There you will see some of the most pristine dark skies available anywhere in the continental US! The scenery is spectacular and the ride there is incredibly beautiful; there are many wonderful side trips along the way. Barcroft is HIGH, and it's incredibly dark! Limiting Magnitude is very conservatively estimated at magnitude 6.4. The stars and Milky Way will blow you away (see Carter's image)! It's an outstanding place for astro-imaging since imaging devices aren't dependent on oxygen, and indeed, do better with less of it.</p> <p>Barcroft is also one of the most comfortable deep sky sites anywhere (if you can take the high altitude reasonably well). There are bunk beds, showers, flush toilets, TV and videos, an oxygen tank in the dining room, a well-equipped workshop for tinkering and the highest pool table and library in the continental U.S. It's an immensely fun place to hang out, learn how to observe, and Astro-bond. The food is terrific!</p> <p>You don't have to stay the whole time but the longer you stay the more preference you get. Another benefit of staying longer is that you will acclimatize better and are more likely to have great weather. I strongly recommend at least one day spent at some altitude for acclimatization. Places such as Bridalveil Creek Campground in Yosemite at 6971' above sea level (ASL), a hotel room in Mammoth Lakes (7921' ASL), or the Grandview Campground (8561' ASL).</p> <p>Due to the level of research at Barcroft we are limited in the number of participants (usually about 20 but sometimes fewer). Priority will be given to those staying 3 nights or more. Send your check for \$68 per person per night at Barcroft, payable to:</p> <p>Dave Rodrigues, (A.K.A. the AstroWizard), 1633 Graff Ct., San Leandro, CA 94577-3938</p> <p>If you have questions or are interested, please call me A.S.A.P. at (510) 483-9191 or Email me atdavevrod@aol.com. I have a write-up that gives more info. I prefer and respond more quickly to phone calls or voice mail. NOTE: We will make it possible to pay via PayPal in the next few days (by 8/23/2011).</p>
<p>Friday, 9/29 – Sunday, 10/1</p> <p>Lake San Antonio County Park</p>	<p>CAL STAR STAR PARTY http://www.observers.org/CalStar/</p>

**Friday, 10/28 –
Tuesday, 11/1**

ANTIQUATE TELESCOPE SOCIETY MEETING/TOUR OF KITT PEAK NATIONAL OBSERVATORY – ARIZONA

These are great tours where one gets to see the inner workings of great professional and public astronomical observatories as well as hear neat lectures. This one will be nearby in AZ. Highly recommended! Check out their web site.

<http://www.webari.com/oldscope/>

On October 28 through Nov. 1, 2011, the Antique Telescope Society will hold its 20th Annual Convention in Tucson, AZ, with optional tours planned for the two following days. One of the highlights will occur on Saturday, October 29, when we will take a VIP tour of Kitt Peak during the day and have optional observing on Kitt Peak during the evening. In addition, the program includes a reception on Friday evening and a banquet on Sunday which will feature a keynote address. The Convention will also have talks and exhibits. A tour of Steward Mirror Laboratory is planned for Friday, a tour of the Whipple Observatory on Mount Hopkins will be held on Monday, and a tour of Mount Graham International Observatory and its Large Binocular Telescope is planned for Tuesday. While in Tucson, the Four Points Sheraton Hotel University Plaza will serve as our headquarters. We look forward to welcoming ATS members and friends to Tucson. Please join us.

Ken Launie, Convention Co-Chairman and President Peter Abrahams, Convention Co-Chairman and Paper Sessions Chairman Jack Koester, Treasurer Walter H. Breyer, Executive Secretary

NASA SCIENCE NEWS

The Science@NASA team is pleased to announce a new product: the ScienceCast. Every week, we produce a short video highlighting a topic in NASA science news. This week's episode is about the night sky. Check out "Spring is Fireball Season" on Youtube: <http://www.youtube.com/watch?v=ssMdITbvHJk>

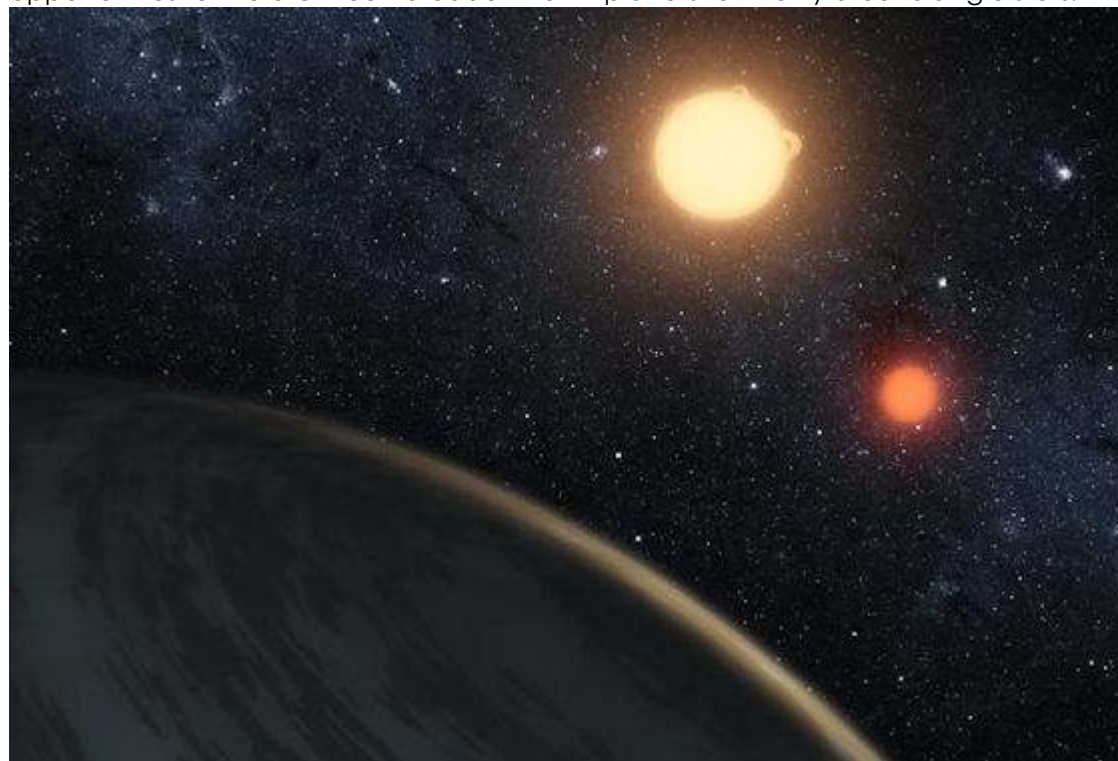
A complete list of ScienceCast episodes may be found on Science@NASA's Youtube channel: <http://www.youtube.com/user/ScienceAtNASA> . Enjoy!

KEPLER DISCOVERS A PLANET WITH TWO SUNS

Sept. 15, 2011: The existence of a world with a double sunset, as portrayed in the film Star Wars more than 30 years ago, is now scientific fact. NASA's Kepler mission has made the first unambiguous detection of a circumbinary planet -- a planet orbiting two stars -- 200 light-years from Earth.

Unlike Star Wars' Tatooine, the planet is cold, gaseous and not thought to harbor life, but its discovery demonstrates the diversity of planets in our galaxy. Previous research has hinted at the existence of circumbinary planets, but clear confirmation proved elusive. Kepler detected such a planet, known as Kepler-16b, by observing transits, where the brightness of a parent star dims from the planet crossing in front of it.

"This discovery confirms a new class of planetary systems that could harbor life," Kepler principal investigator William Borucki said. "Given that most stars in our galaxy are part of a binary system, this means the opportunities for life are much broader than if planets form only around single stars. This milestone discovery



confirms a theory that scientists have had for decades but could not prove until now."

An artist's concept of Kepler-16b, the first planet known to definitively orbit two stars -- what's called a circumbinary planet. The planet, which can be seen in the foreground, was discovered by NASA's Kepler mission.

A research team led by Laurance Doyle of the SETI

Institute in Mountain View, Calif., used data from the Kepler space telescope, which measures dips in the brightness of more than 150,000 stars, to search for transiting planets. Kepler is the first NASA mission capable of finding Earth-size planets in or near the "habitable zone," the region in a planetary system where liquid water can exist on the surface of the orbiting planet.

Scientists detected the new planet in the Kepler-16 system, a pair of orbiting stars that eclipse each other from our vantage point on Earth. When the smaller star partially blocks the larger star, a primary eclipse occurs, and a secondary eclipse occurs when the smaller star is occulted, or completely blocked, by the larger star.

Astronomers further observed that the brightness of the system dipped even when the stars were not eclipsing one another, hinting at a third body. The additional dimming in brightness events, called the tertiary and quaternary eclipses, reappeared at irregular intervals of time, indicating the stars were in different positions in their orbit each time the third body passed. This showed the third body was circling, not just one, but both stars, in a wide circumbinary orbit.

The gravitational tug on the stars, measured by changes in their eclipse times, was a good indicator of the mass of the third body. Only a very slight gravitational pull was detected, one that only could be caused by a small mass. The findings are described in a new study published Friday, Sept. 16, in the journal Science.

"Most of what we know about the sizes of stars comes from such eclipsing binary systems, and most of what we know about the size of planets comes from transits," said Doyle, who also is the lead author and a Kepler participating scientist. "Kepler-16 combines the best of both worlds, with stellar eclipses and planetary transits in one system."

This discovery confirms that Kepler-16b is an inhospitable, cold world about the size of Saturn and thought to be made up of about half rock and half gas. The parent stars are smaller than our sun. One is 69 percent the mass of the sun and the other only 20 percent. Kepler-16b orbits around both stars every 229 days, similar to Venus' 225-day orbit, but lies outside the system's habitable zone, where liquid water could exist on the surface, because the stars are cooler than our sun.

"Working in film, we often are tasked with creating something never before seen," said visual effects supervisor John Knoll of Industrial Light & Magic, a division of Lucasfilm Ltd., in San Francisco. "However, more often than not, scientific discoveries prove to be more spectacular than anything we dare imagine. There is no doubt these discoveries influence and inspire storytellers. Their very existence serves as cause to dream bigger and open our minds to new possibilities beyond what we think we 'know.'"

For more information about the Kepler-16 discovery, visit <http://kepler.nasa.gov/Mission/discoveries/kepler16b/>

Production Editor: [Dr. Tony Phillips](#) | Credit: Science@NASA

More Information

[more images and animations](#)
[Kepler home page](#) -- from nasa.gov

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New views of the second most massive object in the asteroid belt.

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Webmaster	Mitchell	wbmstr@sfaa-astronomy.org
	Schoenbrun	
	Matthew Jones	

Club Telescopes

The SFAA owns eight very fine, easy to use, loaner telescopes well-suited for deep sky, planets, and star parties. All scopes are available to any SFAA member. The loaner custodians for the majority of our fleet are Pete & Sarah Goldie. Please contact them at telescopes@sfaa-astronomy.org for details if you are interested in borrowing a scope or if you have items you can donate for the loaner program (eyepieces, star maps/books, red flashlights, collimator, etc.). Please contact the appropriate member indicated below if you are interested in borrowing one of the telescopes.

- 1) 6" f/10.3 Dobsonian/Ken Frank ken@sfaa-astronomy.org
- 2) 8" f/7 Dobsonian/Pete Goldie
- 3) 8.5" f/6 Dobsonian/Pete Goldie
- 4) 10" f/8 Dobsonian/Pete Goldie
- 5) 114mm f/4 Newtonian StarBlast/Pete Goldie
- 6) 8" f/10 Celestron SCT/Annette Gabrielli/ annette@sfaa-astronomy.org
- 7) 8" f/10 Meade SCT/Stefanie Ulrey/treasurer@sfaa-astronomy.org
- 8) 9.5" f/5.6 Celestron Newtonian/Ken Frank/ ken@sfaa-astronomy.org

Club Astronomy Videos

The SFAA owns a series of astronomy videotapes featuring Alex Filippenko, a world-renowned professor of astronomy at UC Berkeley. The videotapes provide an introduction to astronomy and cover topics such as the Solar System, the lifecycles of stars, the nature of galaxies, and the birth of the Universe. The SFAA loans the tapes free to all members. If you are interested in viewing these tapes, you may check them out at any of the SFAA General Meetings. These tapes were kindly donated to the SFAA by Bert Katzung. For information on the course tapes themselves:

<http://www.teach12.com/ttc/assets/coursedescriptions/180.asp>

Membership Dues

Membership is billed for each upcoming year on June 30. Members may receive no more than one bulletin after the expiration of membership.

SFAA Website and Online Services

The SFAA web site at sfaa-astronomy.org is provided to our members and the general public for the sharing of club information and services. The web site contains links for club [star parties](#), [events](#), [newsletters](#), [lectures](#) and [meetings](#). If you wish to interact with other people who are interested in astronomy, the SFAA web site offers public and members only [bulletin board forums](#). If you wish to remain up-to-date on club activities, then we encourage you to subscribe to one or both of our public [mailing lists](#), which will allow you to receive our newsletter and/or club announcements via email. Other useful and interesting information and services are available on the site such as [observing location reviews](#), member [astronomy photos](#), and [members only telescope loans](#). Information about SFAA's membership, organization and by-laws are available at the club's online public document [archive](#). If you need to contact a representative of the SFAA, then please visit our [contacts](#) page to help in finding the right person to answer your questions.

Above the Fog is the official bulletin of the San Francisco Amateur Astronomers. It is the forum in which club members may share their experiences, ideas, and observations. We encourage you to participate by submitting your articles, announcements, letters, photos and drawings. We would also like to hear from our new members. Tell us about yourself – what you have done in the past and what other clubs you have joined. **The deadline for the next issue is the 25th day of the month.** Send your articles to Editor@sfaa-astronomy.org

Sharing the Wonders of the Universe

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Information Hotline: (415) 289-6636

Has your membership expired? Your mailing label includes the month and year through which your membership is paid. If it is past, your membership has expired and this may be your last issue.



San Francisco Amateur Astronomers
P.O. Box 15097
San Francisco, CA 94115

MEMBERSHIP APPLICATION

Membership is billed for each upcoming year on June 30. Between January 1 and June 30, new members pay one half the amount listed below

Membership Categories (Check one): \$10 Youth/Student \$40 Institutional
 \$25 Individual \$75 Supporting
 \$30 Family

Information: Name(s) _____
 Address _____
 City _____
 State _____ Zip _____
 Home Phone _____
 E-Mail _____

You can choose E-Mail (Recommended) or hard copy delivery for *Above the Fog* (Check one)
 E-Mail Hard Copy

Please make checks payable to San Francisco Amateur Astronomers and mail to:

San Francisco Amateur Astronomers
POB 15097
San Francisco CA 94115