

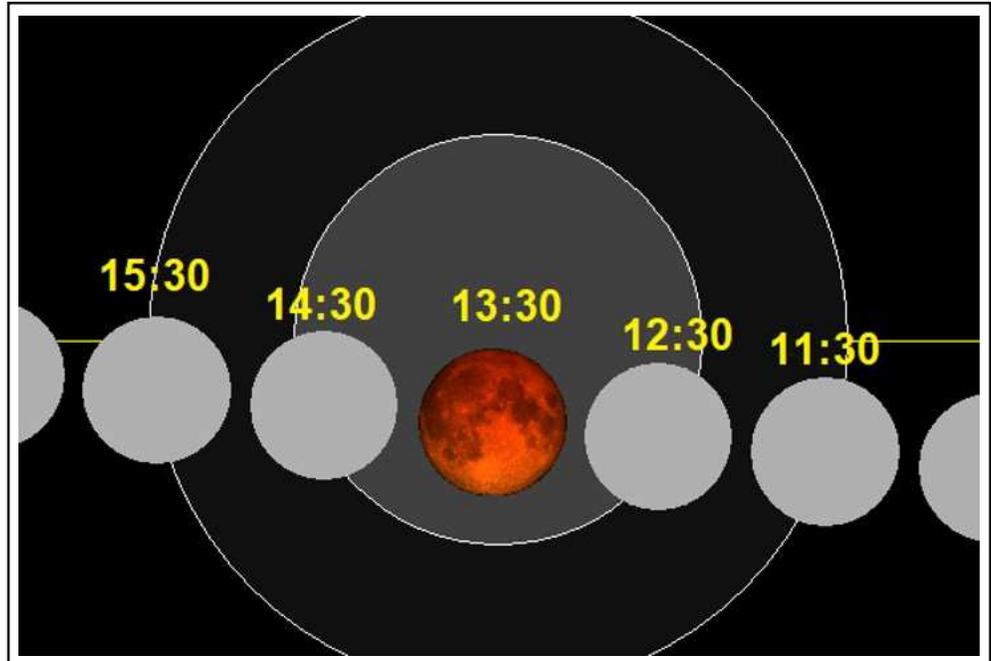
The SAN MATEO COUNTY ASTRONOMICAL SOCIETY

February 2018 — 648th General Meeting Notice



EVENT HORIZON

Founded in 1960, the San Mateo County Astronomical Society is a 501(c)(3) non-profit organization for amateur astronomers and interested members of the public. Visitors may attend Society meetings and lectures on the first Friday of each month, September to June, and star parties two Saturdays a month. All events are free for visitors and guests. Family memberships are offered at a nominal annual cost. Detailed info is found at www.smcasastro.com, where those who want can join via Paypal. Membership includes access to this monthly Event Horizon newsletter, discounted costs and subscriptions to calendars and magazines, monthly star parties of the Society and the College of San Mateo, use of loaner telescopes, field trips, social occasions and general meetings presenting guest speakers and programs. For additional information, please email us at SMCAS@live.com, or call us at (650) 678-2762.



A TOTAL LUNAR ECLIPSE will occur on the morning of January 31. Times shown in the schematic are UTC. Subtract 8 hours for our time zone; for example mid-eclipse will be at 5:30 AM PST. The partial eclipse ends at 7:12 AM, almost exactly the time of sunrise in the San Mateo area. Roger W. Sinott offers some observing suggestions at the [Sky & Telescope web site](#).

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DATES TO SAVE

- Feb 2:** General meeting, pizza, and presentation at the CSM Planetarium. Details on page 4.
 - Feb 20:** SMCAS Board Meeting, CSM ISC room.
 - Mar 2:** General meeting at the CSM Planetarium.
 - Mar 20:** SMCAS Board Meeting, CSM ISC room.
- More events and further details on page 7.

President's Corner

With the start of the new year, we can all look forward to an exciting year of astronomy events, discoveries and activities!

Alas, there is no total solar eclipse in 2018. The 2017 Great American Eclipse was certainly one of the highlights of 2017 for many of our members, Our memories of this eclipse will have to keep us going until the next total solar eclipses in 2019 (July 2 in South America, and December 26 annular eclipse in Asia/Australia), places that unfortunately will be difficult to get to for most folks. For you hardy adventurers, there are three partial solar eclipses in 2018: Antarctica and the southern tip of South America (February 15), Australia (July 13), and the Arctic (August 11). I am going to hold out for the total eclipses!

It's hard to predict what sort of major astronomical and cosmological scientific discoveries will be announced in 2018, but you can bet there will be something! The roster of space missions slated to launch in 2018 is impressive, running the gamut from a moon lander by India (Chandrayaan 2), NASA's Mars InSight mission (launch May 5th) and Mars landing (launch November 26), two Asteroid landers and sample returns by NASA and JAXA, the Parker Solar Probe which will "touch the sun", a fiery end to the Juno Mission as it plunges into Jupiter's atmosphere, and lastly my favorite: TESS (Transiting Exoplanet Survey Satellite) which can be thought of as Kepler's big brother. More details on these and other 2018 missions can be found at:

<http://www.skyandtelescope.com/astronomy-news/looking-ahead-space-missions-2018/>

Closer to home, we at SMCAS expect to have a busy 2018 with our outreach and social activities. We will continue our core activities: the Crestview Park star parties and school star parties, and the Fall Family Science and Astronomy Festival being the highlights of our outreach. We will also continue our usual general meetings/socials with high quality presentations, equinox socials, banquets for our members and guests, and try and do at least one field trip to a local site such as SLAC National Labs. I also encourage all members to become actively engaged as a SMCAS volunteer in whatever capacity you can. The more volunteers we have, the more effective we can be as an organization, and the more personal benefit you will get from your membership!

Looking back at last year, our Treasurer Karen Boyer has prepared a summary of the main highlights about incoming and outgoing dollars for 2017 (see p. 3). Karen comments that what stands out the most is the consistency of the membership base. It is the year after year contribution support that makes our club successful.

We received 16 new memberships for the 2017 calendar year which is a substantial increase over the prior year. This kind of information tells me that our education and outreach efforts are taking hold. Keep up the good work SMCAS you are doing a great job!

So, happy new year, and see you at the General Meeting on February 2nd!

Marion Weiler

President, San Mateo County Astronomical Society

San Mateo County Astronomical Society

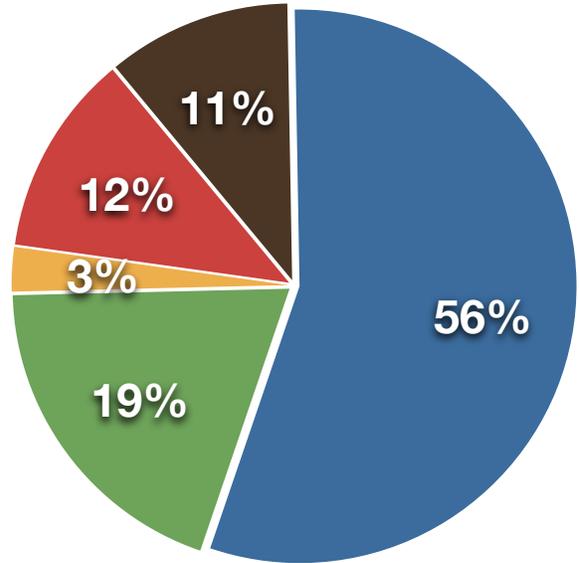
Financial graphic for 2017

REVENUE

Renewing Members	\$1,298.88
New Members	\$453.81
Donations to SMCAS	\$60.59
Donations for Pizza	\$275.67
Calendar sales	\$251.07
	\$2,340.02

- Renewing Members
- New Members
- Donations to SMCAS
- Donations for Pizza
- Calendar sales

Revenue

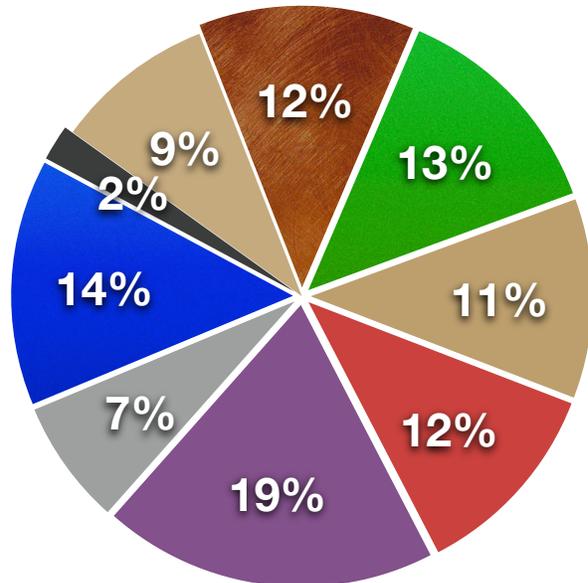


EXPENSES

Astroleague	\$300.00
Insurance	\$315.00
Web & PO Box	\$278.05
Speaker Honorariums	\$280.00
Pizza	\$465.18
Qtrly Socials, Banquet	\$174.32
Admin. & Corp fee	\$342.78
Support for IDA	50.00
Calendar purchases	223.00
	\$2,428.33

- Astroleague
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Expense



SMCAS General Meeting and Presentation on Friday February 2, 2018

Kelly Stifter

PhD student

SLAC National Accelerator Laboratory, Stanford University

Direct Detection of Dark Matter

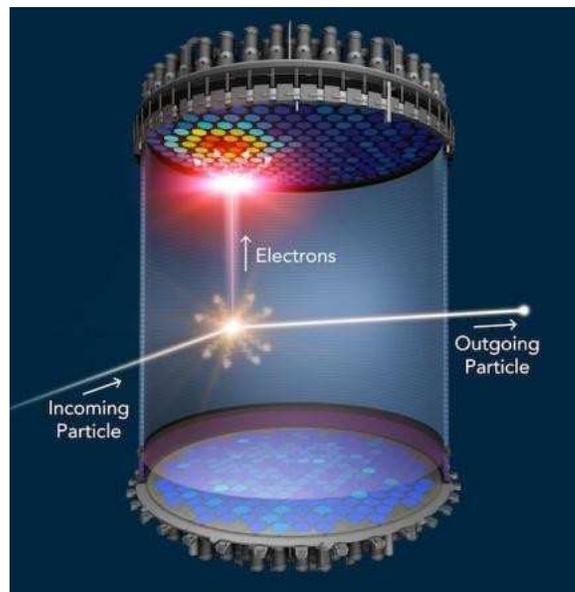
Friday, February 2, 2018, College of San Mateo, Building 36

SMCAS General meeting at 7:00 p.m. ISC Room, room 110

Presentation at 8:00 p.m. in the CSM Planetarium

Free and open to the public, free parking (lots 5 and 6 recommended)

The LUX ZEPELIN (LZ) experiment is a next-generation dark matter direct detection experiment, to be located at the Sanford Underground Research Facility (SURF) in South Dakota. When completed, the experiment will be the world's most sensitive experiment for WIMPs (Weakly Interacting Massive Particles) over a large range of WIMP masses. LZ is a collaboration of 30 institutes in the US, UK, Portugal and Russia.



Kelly Stifter is a PhD student in the Physics Department with the SLAC National Accelerator Laboratory, Stanford University. In 2015, she was an undergraduate researcher at CERN, in Geneva Switzerland. From 2012–2014 she was a Physics teaching assistant at the University of Minnesota. Prior to that she was an intern at Fermilab in Batavia, Illinois. Her current research at SLAC involves system testing for the upcoming LZ detector, which will be looking for illusive Dark Matter particles called WIMPs. SLAC's participation in LZ is part of the research program of the SLAC–Stanford Kavli Institute for Particle Astrophysics and Cosmology.

September Meeting Review

Finding Exoplanets with the Gemini Planet Imager

By Ken Lum

Editor's note: Ken wrote this review of our September meeting back in October, but due to unusual circumstances it did not make it into the October issue. It was therefore held in reserve, stored up until the proper time for it to be published. Now at last the long awaited day has come, a day in which...What? Oh, right. Over to you, Ken.

Dr Vanessa Bailey of Stanford University, KIPAC came to our September meeting to describe her work with the Gemini Planet Imager (GPI) which is being used to directly image exoplanets around other stars.

Since exoplanets were first discovered in the mid 1990s, it has been the goal of astronomers to find ways to directly image these planets. Directly imaging exoplanets would enable observations not possible with the indirect methods that were originally used to discover them. These include direct confirmations that a presumptive exoplanet discovery really is an exoplanet. Spectroscopy can be done to look for chemical constituents on the planet, some of which might be signatures of compatibility with life. More accurate measurements can also be made of the physical characteristics of exoplanets such as their orbital characteristics, temperatures, and masses. Observations can be made of how an exoplanet interacts with its star's protoplanetary disk as in the case of Fomalhaut b if such a disk is still present and even give indications that it might have rings which result in the exoplanet being exceptionally bright.

But direct imaging is challenging mostly because a majority of exoplanets are relatively close to their much brighter companion stars causing the planet to be lost in the star's glare. For this reason only a small minority subset of exoplanets are favorable

candidates for direct imaging. These are mostly exoplanets that orbit far from their stars and planetary systems whose orbital planes are at nearly right angles to our line of sight. Brighter exoplanets are also better candidates for this kind of detection.

The Gemini Planet Imager (GPI) is an instrument designed to perform direct imaging of exoplanets in the near infrared. It was put into service in 2014 on the 8 meter Gemini South telescope on Cerro Pachon in the Chilean Andes mountains. The instrument includes a deformable mirror adaptive optics system, a calibration interferometer, a stellar coronagraph, and a spectrograph.

The adaptive optics system consists of a sodium laser mounted on the telescope which projects an artificial star into the upper atmosphere at about 90 km altitude near the line of sight to the astronomical object being observed. This laser star image is imaged by the adaptive optics system to correct everything in the telescope's field of view for atmospheric distortion using computer deformable mirrors. The calibration interferometer further refines these calibrations.

A stellar coronagraph is placed in the optical path to block the overwhelming brightness of the parent star so that fainter objects near the star can be seen. Finally, the spectrograph is used to perform spectroscopy on the observed objects to determine their chemical composition and ascertain their line of sight (radial) velocities towards us or away from us.

Some Sample Images from the GPI

A. 51 Eridani b was the first exoplanet discovered and imaged by GPI in December, 2014 (Fig. 1, p. 6). Spectra from the exoplanet indicate the

Continued on p. 6

Finding Exoplanets, continued from p. 5

presence of water and methane.

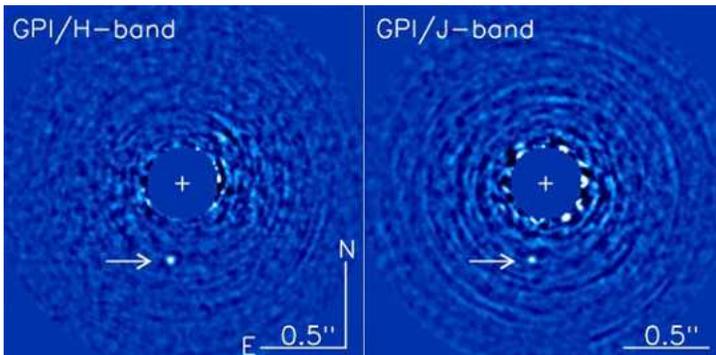


Figure 1. GPI image of 51 Eridani b (arrow).

B. HD 106906 is another star imaged by GPI some 300 light years away and found to have a planet, HD 106906b, very far out at a distance of 650 AU or 16 times that of the distance between the Sun and Pluto. This planet was discovered by Dr. Bailey in 2014 with the Hubble Space Telescope and subsequently reimaged with the GPI. Its distance from its star along with the finding of a possible comet or debris belt around the star suggests the planet may have been ejected from its stellar

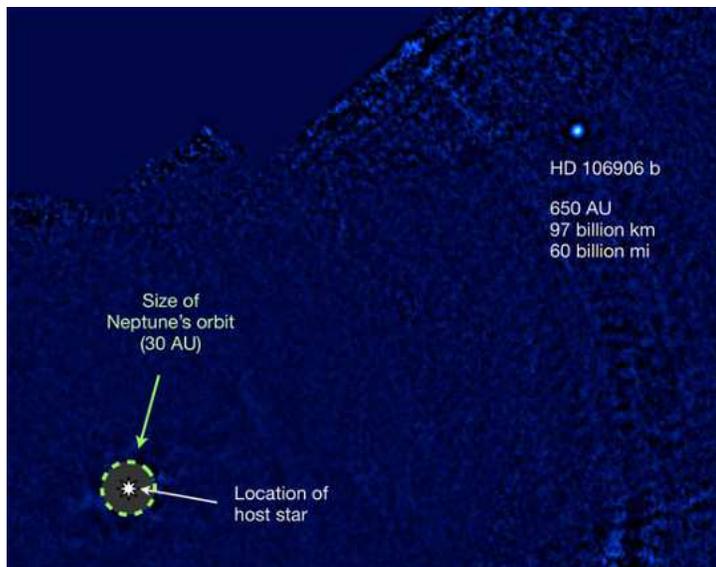


Figure 2. The star HD 106906, which seems to have flung its planet HD 106906b, out of its neighborhood out to a distance of 650 AU. An outline of Neptune's orbit to scale is drawn in.

neighborhood as a result of all the interactions the planet has had since its formation (Fig. 2).

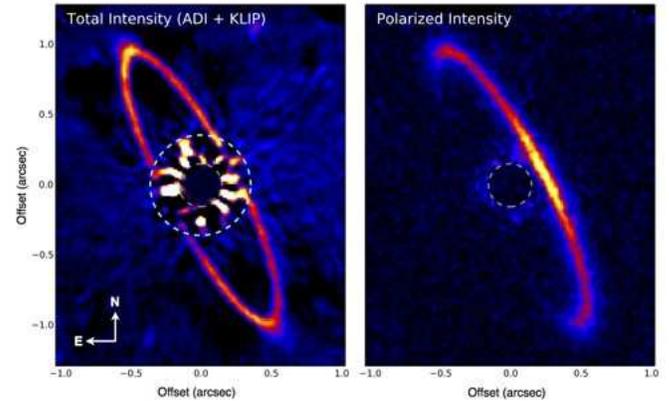


Figure 3. GPI image of the circumstellar disk around HR 4796A.

C. HR 4796A is a star with a circumstellar disk of about 75 astronomical units in diameter (Fig. 3).

D. HR 8799 is a star with 4 planets in orbit around it. Three of them are shown in this GPI photo (Fig. 4).

A proposed planet imaging satellite is in the works called WFIRST (Wide Field Infrared Survey Telescope) to be launched in the mid 2020's to search for extrasolar planets by direct imaging from space and gravitational microlensing.

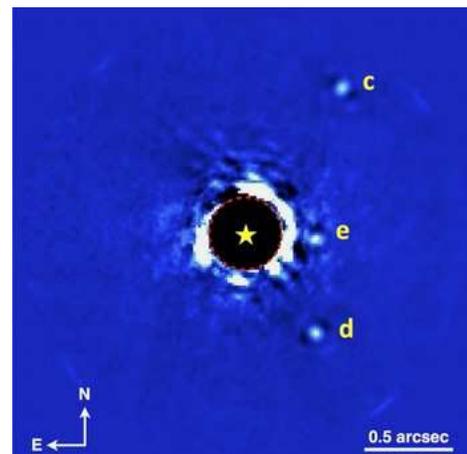


Figure 4. GPI photo of HR 8799 showing three of its four planets.

Upcoming SMCAS Meetings and Events

We have many fun and interesting activities planned in the coming months. See the web site (www.smcasastro.com) or contact Marion Weiler (mgwe@pacbell.net) for more information or to volunteer at any of these events. Please contact Ed Pieret (epieret@comcast.net) if you are available to help out with Star Parties at Crestview Park and other locations.

Wed, Jan 31	4:00 am	Total lunar eclipse
Fri, Feb 2	7:00 pm	General Meeting, Pizza Social and Presentation
Sat, Feb 10	5:45 pm	Crestview Park Star Party
Sat, Feb 17	5:45 pm	Crestview Park Star Party
Tue, Feb 20	7:00 pm	SMCAS Board Meeting
Fri, Mar 2	7:00 pm	General Meeting, Pizza Social and Presentation
Sat, Mar 10	6:15 pm	Crestview Park Star Party
Sat, Mar 17	7:15 pm	Crestview Park Star Party
Tue, Mar 20	7:00 pm	SMCAS Board Meeting
Sat, Mar 24	6:00 pm	Spring Equinox Social

General meetings and board meetings are held in the ISC Room (room 110) in building 36 at the College of San Mateo. For directions to the building or to the star party site at Crestview Park in San Carlos, see page 11. All SMCAS members are welcome at board meetings.

The times given for the star parties are approximately at sunset. Arrive then to set up a telescope or if you want to learn about telescopes. If you would like to merely see the wonders of the night sky through our telescopes, observing starts about an hour later and usually continues for about two hours.

Sixty Years of Observing Our Earth

By Teagan Wall

Satellites are a part of our everyday life. We use global positioning system (GPS) satellites to help us find directions. Satellite television and telephones bring us entertainment, and they connect people all over the world. Weather satellites help us create forecasts, and if there's a disaster—such as a hurricane or a large fire—they can help track what's happening. Then, communication satellites can help us warn people in harm's way.

There are many different types of satellites. Some are smaller than a shoebox, while others are bigger than a school bus. In all, there are more than 1,000 satellites orbiting Earth. With that many always around, it can be easy to take them for



Explorer 1 is the small section on top of the large Jupiter-C rocket that blasted it into orbit. With the launch of Explorer 1, the United States officially entered the space age. Image credit: NASA.

granted. However, we haven't always had these helpful eyes in the sky.

The United States launched its first satellite on Jan. 31, 1958. It was called Explorer 1, and it weighed in at only about 30 pounds. This little satellite carried America's first scientific instruments into space: temperature sensors, a microphone, radiation detectors and more.

Explorer 1 sent back data for four months, but remained in orbit for more than 10 years. This small, relatively simple satellite kicked off the American space age. Now, just 60 years later, we depend on satellites every day. Through these satellites, scientists have learned all sorts of things about our planet.

For example, we can now use satellites to measure the height of the land and sea with instruments called altimeters. Altimeters bounce a microwave or laser pulse off Earth and measure how long it takes to come back. Since the speed of light is known very accurately, scientists can use that measurement to calculate the height of a mountain, for example, or the changing levels of Earth's seas.

Satellites also help us to study Earth's atmosphere. The atmosphere is made up of layers of gases that surround Earth. Before satellites, we had very little information about these layers. However, with satellites' view from space, NASA scientists can study how the atmosphere's layers interact with light. This tells us which gases are in the air and how much of each gas can be found in the atmosphere. Satellites also help us learn about the clouds and small particles in the atmosphere, too.



Continued on p. 10

February Rise and Set Chart

SMCAS 2017 (PST)	Feb 10 Rise	Feb 10 Set	Feb 17 Rise	Feb 17 Set	Feb 24 Rise	Feb 24 Set
Sun	7:02 AM	5:43 PM	6:54 AM	5:51 PM	6:45 AM	5:58 PM
Moon	3:17 AM	1:32 PM	8:06 AM	7:51 PM	12:31 PM	2:10 AM
Mercury	7:00 AM	5:13 PM	7:06 AM	5:48 PM	7:10 AM	6:26 PM
Venus	7:33 AM	6:19 PM	7:29 AM	6:34 PM	7:23 AM	6:50 PM
Mars	2:24 AM	12:10 PM	2:16 AM	11:58 AM	2:09 AM	11:46 AM
Jupiter	12:59 AM	11:14 AM	12:34 AM	10:48 AM	12:08 AM	10:22 AM
moons with E on left	ijce G		c J e g		J i e g c	
3 AM following morning	J=Jupiter, c=Callisto, e=Europa, g=Ganymede, i=Io					
Saturn	4:23 AM	2:00 PM	3:58 AM	1:35 PM	3:32 AM	1:10 PM
Uranus	9:49 AM	10:50 PM	9:22 AM	10:24 PM	8:55 AM	9:57 PM
Neptune	8:06 AM	7:23 PM	7:39 AM	6:57 PM	7:12 AM	6:31 PM
Pluto	5:21 AM	3:05 PM	4:54 AM	2:38 PM	4:27 AM	2:11 PM

- Star parties are at Crestview on the 10th and 17th.
- Jazz Under the Stars is at CSM on the 24th.

- courtesy of Ron Cardinale

Fundraising for the Group: SMCAS Participates in AmazonSmile and Receives a Percentage of Your Purchase

SMCAS is now enrolled in AmazonSmile, a program that enables certified 501(c)(3) non-profit organizations to receive donations from eligible purchases at Amazon.



To enroll in the program, go to smile.amazon.com. On your first visit to this site, you can select a charitable organization – San Mateo County Astronomical Society (SMCAS) – that will receive 0.5% of the purchase price of eligible items on Amazon. How will you know if an item is eligible? Items are clearly and literally marked on the product detail pages with “Eligible for AmazonSmile donation.” For more information, go to smile.amazon.com/about.

February 2018						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
28 5:28:23 PM Sunset	29	30	31	01	02 7:00 PM General Membership Meetin	03
04 5:36:12 PM Sunset	05	06	07	08	09	10 5:15 PM Crestview Star Party
11 5:43:57 PM Sunset	12	13	14	15	16	17 6:00 PM Crestview Star Party
18 5:51:30 PM Sunset	19	20	21	22	23	24
25 5:58:46 PM Sunset	26	27	28	01	02 7:00 PM General Membership Meetin	03

• observing event
• club event
• community event

Calendar courtesy of Ed Pieret

Sixty Years of Observing Earth, continued from p. 8

When there's an earthquake, we can use radar in satellites to figure out how much Earth has moved during a quake. In fact, satellites allow NASA scientists to observe all kinds of changes in Earth over months, years or even decades.

Satellites have also allowed us—for the first time in civilization—to have pictures of our home planet from space. Earth is big, so to take a picture of the whole thing, you need to be far away. Apollo 17 astronauts took the first photo of the whole Earth in 1972. Today, we're able to capture new pictures of our planet many times every day.

Today, many satellites are buzzing around Earth,

and each one plays an important part in how we understand our planet and live life here. These satellite explorers are possible because of what we learned from our first voyage into space with Explorer 1—and the decades of hard work and scientific advances since then.

To learn more about satellites, including where they go when they die, check out NASA Space Place: spaceplace.nasa.gov/spacecraft-graveyard

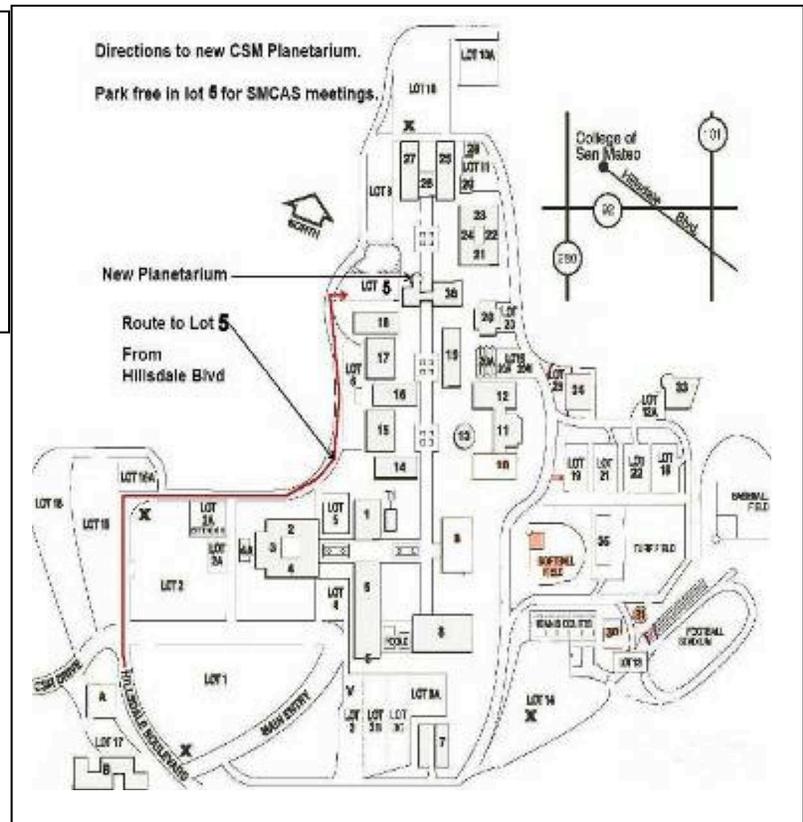
This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!

Directions to SMCAS Meetings at CSM, and to Star Parties

Star Parties are Free to Members and Visitors and are Held Regularly, Weather Permitting

Directions to the CSM Planetarium for Meetings

After exiting Hwy 92 at Hillsdale Blvd, climb the hill towards CSM, passing two traffic lights to the stop sign at the top. Continue straight, bear right then, after the 2nd stop sign, bear left over the rise. Enter the next parking lot on the right, called Lot 5, "Marie Curie". Science Bldg 36 and the planetarium lie straight ahead. Enter Bldg. 36 thru the door facing the lot, or walk around the dome to the courtyard entrance.



Crestview Park

Come on out, and bring the kids, for a mind-blowing look at the Universe!

Bring your binoculars, telescopes, star guides, and lounge chairs for some informal star gazing at Crestview Park.

Dress warmly and wear a hat. Only visitors with telescopes should drive in. Others should park on the street and walk in, or arrive before dark so that car headlights don't affect the observers' dark adaptation. Bring small flash-lights only, covered with red cellophane or red balloon.

These measures avoid safety issues of maneuvering in the dark, as well as ruining the night vision of the viewers.

Please don't touch a telescope without permission. And, parents, please don't let children run around in the dark.

Directions to Crestview Park for Star Parties

From Hwy 101 or El Camino, take Brittan Avenue in San Carlos, west (to the hills). Follow Brittan 2.3 miles (from El Camino) to Crestview Drive. Turn right on Crestview. In half-a-block, you will see a small blue posted sign with an arrow, indicating the entry road into Crestview Park. It lies between houses with addresses #998 and #1000 Crestview Drive.

From Highway 280, take Edgewood Road exit. Go east (toward the Bay) about 0.8 miles. Turn left at Crestview Drive. Go 0.5 mile uphill to where Crestview meets Brittan. Again, drive the half-block, to the sign on the right, and the entry road on the left.

Note: If bringing a telescope and arriving after dark, please enter the Park with your headlamps and white interior lights off. If you aren't bringing a telescope, whether before or after dark, please park along Crestview Drive, and walk in.

2nd Note: Crestview Park is residential, adjacent to homes and backyards. Before inviting potentially noisy groups, please call Ed Pieret at (650) 595-3691 for advice and advisories. Call Ed also to check the weather and 'sky clock', and to see whether the star party is still scheduled.



San Mateo County Astronomical Society Membership Application

rev 04022017

SMCAS@live.com; P.O. Box 974, Station A, San Mateo CA 94403; (650) 678-2762

Date: _____ Please check one: [] New Member or [] Renewal

[] \$30 Regular Family Membership; [] \$15 Student Membership

All members, please indicate areas of interest below. New members, please complete entire form. Renewing members, please provide your name and any information that has changed in the last year.

We will list your name, address, email address, and phone number(s) in our membership roster unless you have checked the box preceding that information. The membership roster is distributed to active members only.

Each member's name and mailing address must be provided to the Astronomical League (AL), SMCAS' parent organization. If you don't want AL to have your phone number and email address, indicate below.

[] Name(s) _____ [] Email Address _____

[] Address _____

[] City & Zip Code _____

[] Phone Number(s): _____ [] Do not provide my phone number(s) to the AL.

[] Don't provide my email address to the AL. (Checking this means you can ONLY get **The Reflector** by regular mail)

Please check one: send **The Reflector** [] by mail, or [] by email.

Areas of Interest

SMCAS encourages member involvement. We invite you to provide additional information about your interests, skills, occupation and prior experience. Please identify SMCAS projects and functions that you might like to help facilitate.

Please indicate which of the following activities might be of interest to you:

_____ Star Parties - Do you own a telescope you can bring: Yes () No ()

_____ General Meetings - Finding (or being) a Speaker. Official greeter. Set up or take down ISC or refreshments.

_____ Family Science Day & Astronomy Festival (Usually at CSM the first Saturday in October).

_____ Social Events - Equinoctial and Summer Solstice potlucks, Summer Star-B-Que, Holiday Potluck.

_____ SMCAS Membership and Promotional Drives

_____ Communications – 'Event Horizon' Newsletter, Website(s), Facebook page, group email, Publicity posting.

_____ Educational Programs – School, museum and library star parties, Bay Area Astro teacher assistants.

Other/Comments: _____

<http://www.SMCASASTRO.com>