

# The SAN MATEO COUNTY ASTRONOMICAL SOCIETY

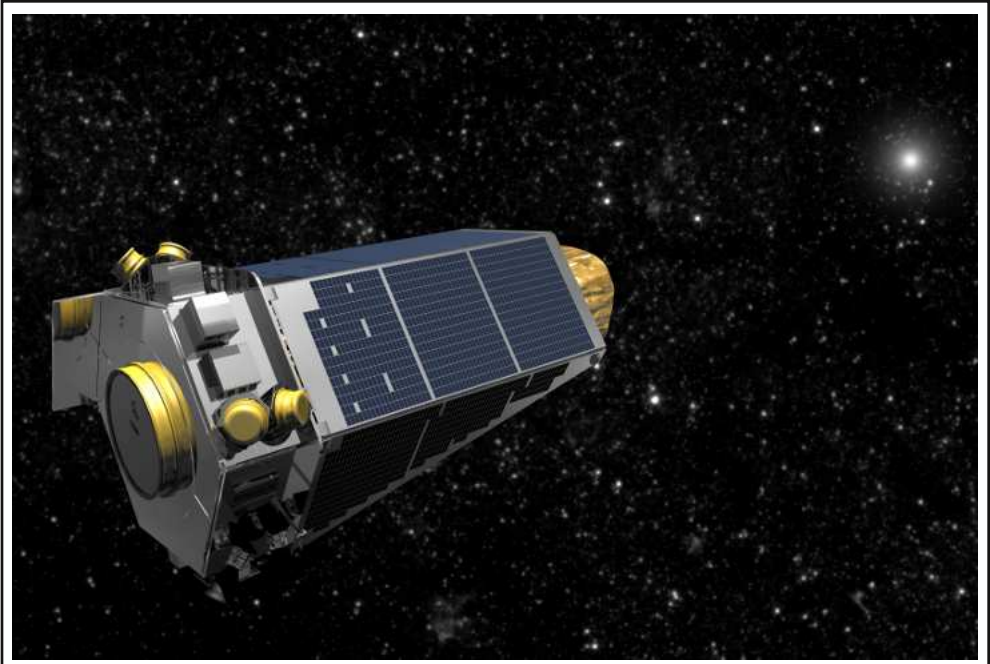
June 2017 — 644th General Meeting Notice



# 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](http://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](mailto:SMCAS@live.com), or call us at (650) 678-2762.



*ON FRIDAY, JUNE 23, SMCAS will host back to back presentations based on data from the Kepler Space Telescope. Dr Steve Kawaler (U. of Iowa) will discuss asteroseismology (star vibrations) and its implications. Dr Dan Fabrycky (U. of Chicago) will describe similarities and dissimilarities between the systems Kepler has discovered and our Solar System. See page 4 for details.*

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## DATES TO SAVE

**Jun 2:** NO MEETING on this date. See Jun 23 instead.

**Jun 23:** Short annual meeting to elect officers, followed by the Kepler Science double presentation. CSM Planetarium.

**Jul 8:** Summer Social and Installation of Officers at Avanti Pizza, 2040 Ralston Ave, Belmont.

**Jul 18:** SMCAS Board Meeting, CSM ISC room.

More events and further details on page 7.

## President's Corner

The CSM Planetarium is closed 6/2, so the Board has decided to cancel the 6/2 general meeting in favor of a very short annual meeting to elect your Society's Officers and Directors for the 2017–18 term at 7:15 pm on Friday 6/23, just before the special presentation. Nominations will close at this time, and we will be holding our elections by a vote of the members present. Please let a Board member know if you are interested in serving, or you (or a friend) can nominate you from the floor at the meeting itself. We are a volunteer organization, and need volunteers to keep our Society running! We are in particular need of a Treasurer, as our current Treasurer, Karen Boyer, will be retiring from that role after several years of excellent service in that role. Thank you Karen!

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As mentioned above, we have an unusual presentation night scheduled for Friday evening, June 23rd starting 7:30pm in the Planetarium: the [Kepler Science Double Header](#) (see also p. 4)! We will have two scientists working with Kepler data talk about their research and results. The background of how this double header came about is interesting.

These two scientists are part of the 275 Kepler and K2 researchers converging from around the world in the Bay Area at Moffett Field for the [Kepler & K2 Science Conference IV](#) June 19–23. This is likely the last Kepler science conference, as the Kepler mission is winding down. The conference covers topics across all science areas that are impacted by Kepler and K2 data, including exoplanets, microlensing, asteroseismology, clusters, stellar activity, extragalactic science, and Solar System studies. The Conference organizers wanted to commemorate the accomplishments of the Kepler mission by having a few of the scientists give public presentations at a variety of organizations and institutes in the Bay Area including SMCAS. When the offer to give presentations went out to this group of 275, 56 scientists volunteered! The result of this is that we (SMCAS) ended up with two great speakers from outside Bay Area, a luxury we seldom have! So, take advantage of this unique situation by attending our special Friday June 23 [Kepler Science Presentation Double Header](#)! And, if you have a particular interest in Kepler, there are going to be many other presentations around the Bay Area during the conference, and you should be able to track them down via an Internet search.

• • •

In May, while visiting family in Anacortes, Washington, I stopped in at the [Anacortes Telescope and Wild Bird](#) store run by owners Herb and Paula York. The unassuming retail outlet on a small rise visible from HW20 is the world headquarters of this store which has been in operation for about 18 years. Anacortes Telescope sells primarily online, worldwide. The storefront has limited inventory. The online sales are supported by warehouses around the country so that orders can be filled more locally most of the time.



*Anacortes Telescope and Wild Bird Store*

**Continued on p. 3**

## **President's Corner, continued from p. 2**

I had stopped in out of curiosity, and the friendly staff quickly approached me to ask if I had any questions. I asked about their business, and was soon introduced to owner Herb York who spent time with me answering my questions and telling me about the history of his business.

Many of our members may have used the website that Anacortes Telescope co-founded and now owns: [AstroMart](#). AstroMart is an online market for used equipment, connecting buyers and sellers. They run both classified ad type listings of items for sale, as well as an auction site. Membership is \$15/year, a relative bargain for the value if being able to buy/sell on a trusted network of around 110,000 participants, no commission charged. Although at first it seemed odd that a retail site would be hosting a site allowing customers to easily buy and sell equipment from each other, it made perfect sense when Herb explained that most of his customers won't buy new equipment until they sell their old stuff! Anacortes Telescope itself sells a wide range of astronomy items, from telescopes/eyepieces to CCD cameras and image processing software, to back yards domes and even outfitting several small observatories in the US and elsewhere. Anyway, a fascinating place to check out, stop by if you get to Anacortes, and say hi to Herb York!



*With Herb York in the store*

### **Marion Weiler**

*President, San Mateo County Astronomical Society*

## **Reminder: Telescope Support and Loaner Program for SMCAS Members**

Among the benefits of SMCAS membership are technical advice from members who are experienced with telescopes, and for active members currently without a telescope, eligibility to borrow telescopes from our loaner telescope program.

If you seek further information about telescope selection, use or maintenance, feel free to contact members Mike Ryan ([jmrastro@yahoo.com](mailto:jmrastro@yahoo.com)), or cell phone 650-678-2762) or Frank Seminaro ([frank\\_seminaro@yahoo.com](mailto:frank_seminaro@yahoo.com)) for guidance.

The contact for the telescope loaner program is

Ed Pieret ([EPIERET@comcast.net](mailto:EPIERET@comcast.net) or 650-862-9602). Currently nine telescopes are available for borrowing, plus a flat mirror called a "Sky Window" designed for use with binoculars (included, or use your own). The Sky Window allows binocular observations to be made while looking down toward the mirror rather than directly up at the sky, aiding stability and avoiding potential neck strain. For more details on the program including a list of available instruments see Ed's article on p. 6 of the May 2017 *Event Horizon*.

*Presentation on Friday June 23, 2017*

## **Exoplanet Science Double Header from the Kepler Telescope!**

### **Sounding Stars while Hunting for Planets**

**Dr Steve Kawaler**

*Professor of Astrophysics, University of Iowa*

### **Bumpy Rides in the Early Lives of Planetary Systems**

**Dr Dan Fabrycky**

*Assistant Professor of Astronomy, University of Chicago*

Friday, June 23, 2017, 7:30–9:00 p.m.

College of San Mateo, in the CSM Planetarium (Building 36)

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

#### **Sounding Stars while Hunting for Planets**

Kepler/K2 data is used to detect and decode subtle vibrations of the stars, a field of science called asteroseismology, similar to how vibrations in the earth's crust can be used in the science of seismology to study the properties of the earth. The decoded vibrations are used to measure stellar properties with high precision (i.e. the mass, radius, and age). Many exoplanet host stars show these oscillations so we work hand-in-hand with Kepler telescope scientists to provide accurate stellar parameters that are needed to characterize the exoplanets. But beyond that, this technique is used to study a wide variety of stars from the inside-out.

*Dr. Steve Kawaler is a Professor of Astrophysics in the Astronomy Program at the Department of Physics and Astronomy at Iowa State University. His work primarily involves exploring the interior structure and evolution of stars. He uses various techniques, but really enjoys using the subtle variations in the brightness (and surface oscillations) of stars as probes of their interior structure (asteroseismology). He is a member of the Steering Committee for the Kepler Asteroseismology Research Consortium (KASC), and for the TESS Asteroseismology Research Consortium (TASC). They are exploiting the asteroseismology that can be done on data that the Kepler, K2, and TESS missions have and will provide in the hunt for Earthlike planets around other stars.*

#### **Bumpy Rides in the Early Lives of Planetary Systems**

Multiple-planet systems detected by the Kepler telescope allow us to understand the similarities and surprising dissimilarities from our own Solar System, and how we think they form and evolve.

*Dr. Dan Fabrycky is an Assistant Professor in the Department of Astronomy and Astrophysics at the University of Chicago. He thrived on Science Olympiad at South Middle School and Prospect High School, which got him started in the sciences. While a physics major at Caltech, he did research in gravitational waves, neutrino oscillations, and synthetic aperture radar. He attended Astrophysics graduate school at Princeton University. He further developed his interest in exoplanets as a Michelson Fellow at Harvard and a Hubble Fellow at UC Santa Cruz.*

## [March Meeting Review](#)

### Using your Eyes and your Camera to get the most out of Solar Eclipses

**By Ken Lum**

Solar eclipse chaser Rob Hawley spoke last month about the upcoming Monday, August 21, 2017 total solar eclipse whose path of totality will stretch across the entire continental US from Oregon to South Carolina with First Contact starting at 9:06AM PDT and totality occurring at 10:19AM PDT in Madras, Oregon. Times of other locations can be found on many sites on the Internet. His first emphasis was for everyone to enjoy this event and not get too tangled up in the intricacies of trying to photograph it. There will be thousands of excellent photos of the eclipse online afterwards, and simply downloading someone else's work is a perfectly good way to add to one's photo collection provided you give proper attribution when showing them.

**No matter what one does, one should always use proper light filtration** with filter material from a provider like [Baader Planetarium](#) and solar filter glasses sold by such providers as [Orion Telescopes and Binoculars](#) of Cupertino. These will be most useful during the partial phases when any part of the uncovered solar disc is shining from behind the Moon. **Such filters are a total necessity to prevent permanent damage to your eyes!** At the time of onset of totality, these filters can be taken down as the Sun and its surrounding corona will be sufficiently diminished in brightness to comfortably view without a filter. Once totality is over, however, it will be necessary to view the partial phases with a filter again.

Should you still want to photograph the eclipse, you can simply take wide field panoramic landscape views during totality with your camera mounted on a tripod. But if you want to take close up views (as the eclipsed Sun and corona are about only 2–3 degrees diameter), a telephoto lens or telescope with a solar filter will have to be



*Diamond ring phase of the November 13, 2012 eclipse from Australia. Photo by Rob Hawley.*

used with your camera. Just as with visual observing, the solar filter should be easily removable once totality commences. Proper mounting of such an imaging arrangement will be critical to hold the camera steady. While a simple tripod could work, a small light weight motorized tracking mount would be a much better choice. Again, Orion Telescopes and Binoculars has such mounts for sale. At the end of the meeting, Ken Lum gave a demonstration of his Takahashi P2Z equatorial mount which he used in 2006 to take a video of that year's eclipse in Turkey. To save weight, Ken adapted his mount to a light weight Gitzo G1548 carbon fiber tripod (1.6" diameter legs).

A newer and much less expensive alternative to the P2Z is the equatorial [SkyGuider Pro Camera Mount by iOptron](#) which costs less than \$500 and includes a built-in rechargeable battery. While this mount comes with a steel tripod, a Gitzo carbon

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## **Solar Eclipses, continued from p. 5**

fiber tripod could also save much weight and be foldable to a smaller, more convenient size. The small motorized alt-azimuth iOptron tracking mounts such as their Cube mounts are also excellent choices.

Rob pointed out many things to look out for during the eclipse. One is the approaching shadow of the Moon which will cause a darkening of the sky to the brightness of twilight. Four planets (Mercury, Venus, Mars, and Jupiter) [will be visible distributed around the eclipsed Sun](#). One can demonstrate the partial phases of the eclipse with pinholes punched in cardboard projecting the solar disc onto light colored surfaces. A white bedsheet can also be laid out on the ground to look for shadow bands just before and after totality occurs. These are low contrast alternating light and dark bands that can be seen projected against white surfaces. Several good videos of this unusual phenomenon can be found on YouTube (for example, [www.youtube.com/watch?v=1I4YNa5-nuk](http://www.youtube.com/watch?v=1I4YNa5-nuk)). Their cause has been speculated on, but a definitive theory is still elusive.

There are many helpful lead up magazine articles on the eclipse. Especially good are the ones in *Sky and Telescope* (January, 2016) by Fred Espenak and Jay Anderson and *Astronomy Magazine* (March, 2016 and August, 2016) by Michael Bakich. The best weather prospects are around small towns in northern Oregon just east of the Cascade mountain range.

At this late date, nearly all bookable hotel rooms along the path of totality are now reserved. There may be some AirBnB rooms available with much searching. There are still spaces available with tour groups but are very expensive in the \$5000 to \$8000 per person price range.

One should expect all roads in favorable areas to



*Rob Hawley with SMCAS President Marion Weiler, holding a colorful pair of eclipse glasses.*

be jammed with traffic on eclipse day accompanied by many unauthorized roadside campsites. So chasing this eclipse on the ground will likely be nearly impossible. Where ever you plan to be you should arrive and set up at least 1–2 days before the event.

Locally the Bay Area will experience an approximate maximal 75% partial coverage of the Sun by the Moon. Many places, most notably public libraries, may have local amateurs providing opportunities to view the eclipse with safe solar filters. CSM, the Chabot Space and Science Center in Oakland and the California Academy of Sciences in San Francisco will definitely have events.

Rob has provided much valuable information on observing and photographing eclipses and accounts of his previous eclipse adventures at his website at:

<http://www.robhawley.net>.

Best of luck to everyone on viewing this first total solar eclipse to come to the US since 1979!

## Upcoming SMCAS Meetings and Events

We have many fun and interesting activities planned in the coming months. See the web site ([www.smcasastro.com](http://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.

**Please note that there are no general meetings in July and August.**

Fri, Jun 2		<b>NO GENERAL MEETING — See June 23 entry instead</b>
Sat, Jun 17	8:30 pm	<b>Crestview Park Star Party</b>
Fri, Jun 23	7:15 pm	<b>Abbreviated Annual Meeting for Election of Officers, followed by Kepler Science Presentation Double Header, CSM Planetarium</b>
Sat, Jun 24	8:30 pm	<b>Crestview Park Star Party</b>
Sat, Jul 8	6:00 pm	<b>Summer Social and Presentation of Officers, at Avanti Pizza, 2040 Ralston Ave, Belmont</b>
Sat, Jul 15	8:30 pm	<b>Crestview Park Star Party</b>
Tue, Jul 18	7:00 pm	<b>SMCAS Board Meeting</b>
Sat, Jul 22	8:30 pm	<b>Crestview Park Star Party</b>
Sat, Aug 19	8:00 pm	<b>Crestview Park Star Party</b>
Mon, Aug 21	8:00 am	<b>Solar Eclipse Observing at CSM</b>
Sat, Aug 26	7:45 pm	<b>Crestview Park Star Party</b>

*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.*

**Evening comet of note:** C/2015 V2 (Johnson). Interactive finder chart is at <http://tinyurl.com/mq5cwwu> (C/2015 V2). For an ephemeris enter "C/2015 V2" at <http://www.minorplanetcenter.net/iau/MPEph/MPEph.html>.

## The Fizzy Seas of Titan

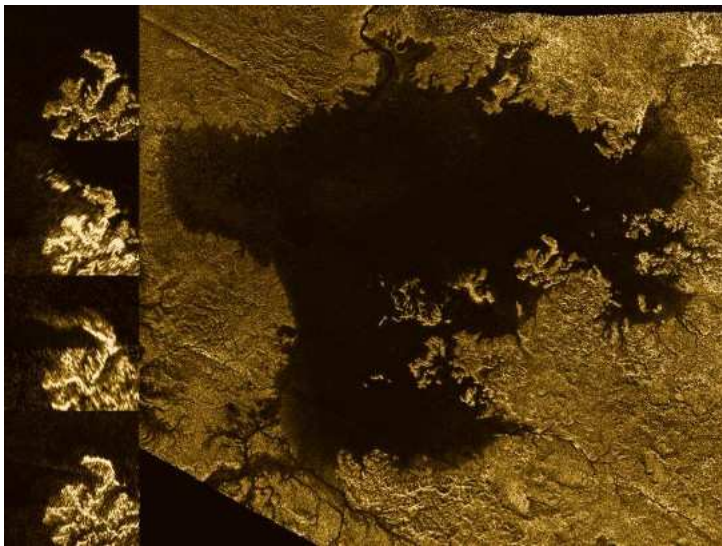
By Marcus Woo

With clouds, rain, seas, lakes and a nitrogen-filled atmosphere, Saturn's moon Titan appears to be one of the worlds most similar to Earth in the solar system. But it's still alien; its seas and lakes are full not of water but liquid methane and ethane.

At the temperatures and pressures found on Titan's surface, methane can evaporate and fall back down as rain, just like water on Earth. The methane rain flows into rivers and channels, filling lakes and seas.

Nitrogen makes up a larger portion of the atmosphere on Titan than on Earth. The gas also dissolves in methane, just like carbon dioxide in soda. And similar to when you shake an open soda bottle, disturbing a Titan lake can make the nitrogen bubble out.

But now it turns out the seas and lakes might be fizzier than previously thought. Researchers at



*Radar images from Cassini showed a strange island-like feature in one of Titan's hydrocarbon seas that appeared to change over time. One possible explanation for this "magic island" is bubbles. Image credits: NASA/JPL-Caltech/ASI/Cornell.*

NASA's Jet Propulsion Laboratory recently experimented with dissolved nitrogen in mixtures of liquid methane and ethane under a variety of temperatures and pressures that would exist on Titan. They measured how different conditions would trigger nitrogen bubbles. A fizzy lake, they found, would be a common sight.

On Titan, the liquid methane always contains dissolved nitrogen. So when it rains, a methane-nitrogen solution pours into the seas and lakes, either directly from rain or via stream runoff. But if the lake also contains some ethane—which doesn't dissolve nitrogen as well as methane does—mixing the liquids will force some of the nitrogen out of solution, and the lake will effervesce.

“It will be a big frothy mess,” says Michael Malaska of JPL. “It's neat because it makes Earth look really boring by comparison.”

Bubbles could also arise from a lake that contains more ethane than methane. The two will normally mix, but a less-dense layer of methane with dissolved nitrogen—from a gentle rain, for example—could settle on top of an ethane layer.

In this case, any disturbance—even a breeze—could mix the methane with dissolved nitrogen and the ethane below. The nitrogen would become less soluble and bubbles of gas would fizz out.

Heat, the researchers found, can also cause nitrogen to bubble out of solution while cold will



**Continued on p. 10**



## June Rise and Set Chart

<b>SMCAS 2017 (PDT)</b>		<b>Jun 17 Rise</b>	<b>Jun 17 Set</b>	<b>Jun 24 Rise</b>	<b>Jun 24 Set</b>
Sun	Solstice on 20th	5:47 AM	8:32 PM	5:49 AM	8:34 PM
Moon		1:24 AM	1:27 PM	6:37 AM	9:16 PM
Mercury	In sun's glare	5:26 AM	8:14 PM	6:02 AM	8:57 PM
Venus	Before sunrise	3:22 AM	4:47 PM	3:16 AM	4:56 PM
Mars	Difficult after sunset	6:39 AM	9:25 PM	6:33 AM	9:16 PM
Jupiter	Most of the night	2:24 PM	2:07 AM	1:58 PM	1:40 AM
Jupiter's moons		igle c		c gi J e	
9:30 PM, East on left		J=Jupiter, c=Callisto, e=Europa, g=Ganymede, i=Io			
Saturn	Opposition on 15th	8:07 PM	5:52 AM	7:37 PM	5:22 AM
Uranus	In the wee hours	2:35 AM	3:42 PM	2:08 AM	3:15 PM
Neptune	In the wee hours	12:48 AM	12:09 PM	12:21 AM	11:41 AM
Pluto	Most of the night	9:50 PM	7:39 AM	9:21 PM	7:10 AM

- Star parties are at Crestview on the 17th and 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](https://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](https://smile.amazon.com/about).

San Mateo County Astronomical Society Event Calendar						
< June 2017 >						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
28	29	30	31	1	2	3 Sunset: 8:28 PM
4	5	6	7	8	9	10 Sunset: 8:32 PM
11	12	13	14	15	16	17 8:33 PM Crestview Star Party Sunset: 8:34 PM
18	19	20	21	22	23 7:30 PM Kepler Presentation	24 8:34 PM Crestview Star Party Sunset: 8:36 PM
25	26	27	28	29	30	1

Calendar courtesy of Ed Pieret

### Seas of Titan, continued from p. 8

coax more nitrogen to dissolve. As the seasons and climate change on Titan, the seas and lakes will inhale and exhale nitrogen.

But such warmth-induced bubbles could pose a challenge for future sea-faring spacecraft, which will have an energy source, and thus heat. “You may have this spacecraft sitting there, and it’s just going to be fizzing the whole time,” Malaska says. “That may actually be a problem for stability control or sampling.”

Bubbles might also explain the so-called magic islands discovered by NASA’s Cassini spacecraft in the last few years. Radar images revealed island-like features that appear and disappear over time. Scientists still aren’t sure what the

islands are, but nitrogen bubbles seem increasingly likely.

To know for sure, though, there will have to be a new mission. Cassini is entering its final phase, having finished its last flyby of Titan on April 21. Scientists are already sketching out potential spacecraft—maybe a buoy or even a submarine—to explore Titan’s seas, bubbles and all.

To teach kids about the extreme conditions on Titan and other planets and moons, visit the NASA Space Place: [spaceplace.nasa.gov/planet-weather](http://spaceplace.nasa.gov/planet-weather)

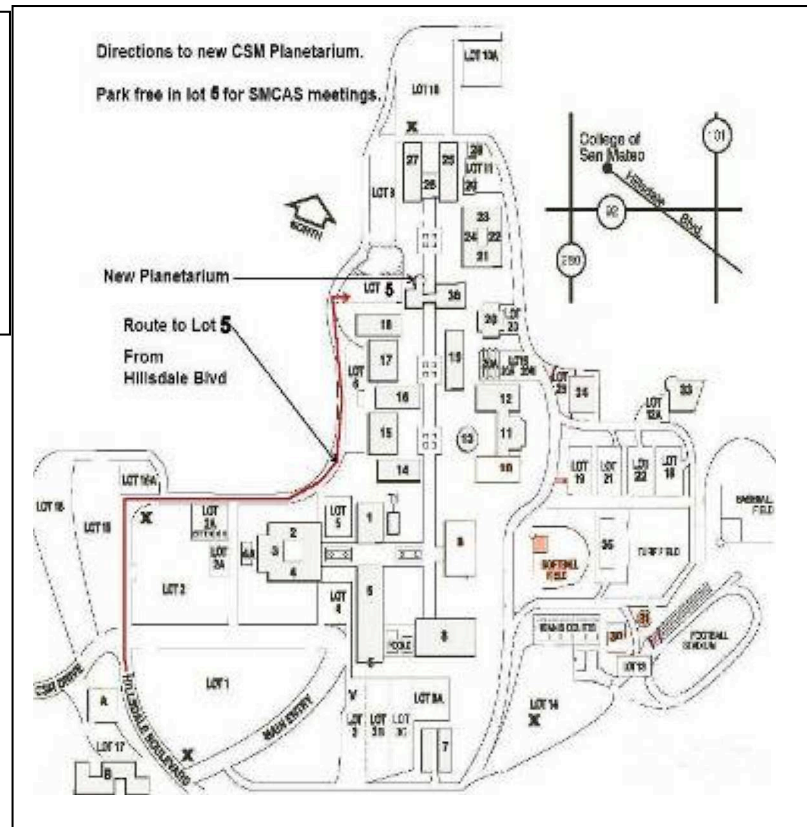
*This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit [spaceplace.nasa.gov](http://spaceplace.nasa.gov) to explore space and Earth science!*

## 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.

**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.

### Directions to Crestview Park for Star Parties

**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](mailto: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>