

The SAN MATEO COUNTY ASTRONOMICAL SOCIETY

April 2018 — 650th 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.



THE SMCAS SPRING EQUINOX SOCIAL held on March 24 was well attended, as shown in this photograph. The evening concluded with a presentation by Ken Lum on the historic Mt Wilson Observatory, which Ken has visited most recently last year. A written account of that visit can be found in the November 2017 Event Horizon.

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DATES TO SAVE

Apr 6: General meeting, pizza, and presentation at the CSM Planetarium. Details on page 3. Nominations for SMCAS officers and board members will open at this time. We encourage your involvement as a volunteer in keeping our Society running smoothly.

Apr 17: SMCAS Board Meeting, CSM ISC room.

Apr 20: Art & Science Presentation by Mohsen Janatpour, CSM.

More events and further details on page 6.

President's Corner

We had a good turnout and lots of food at our Spring Equinox social Saturday (3/24). Thanks to all the Board members who did the set up and brought entrees, and thanks to everyone else for bringing such a variety of great food. No one went hungry! And special thanks to Bob Franklin who once again arranged our meeting location. We are lucky to have access to such a great facility for our socials! Also thanks to Ken Lum for his presentation on the history of the Mt Wilson observatory.



The food at the Spring Equinox social lived up to its usual standard.

Coming up at our April meeting: opening of nominations for Board and executive positions at April meeting. Nominations will be open for at least 60 days, and close at annual meeting in June, where elections will take place. Positions up for election are:

- President
- Vice president
- Treasurer
- Secretary
- 5 Board Members at Large

If you are interested in serving, please let your interests be known to current a current Board member, or nominate yourself from the floor at the close of nominations at the Annual meeting in June. And please feel free to contact any of the Board members to discuss what it's like serving on the Board. Our By-Laws also describes the Board roles and operation of SMCAS. It's a good place to get educated about the Board. The By-Laws can be found at:

<http://www.smcasastro.com/status.html>

Your Board of Directors typically meets in the ISC room at CSM from 7:00-8:30pm monthly, on the third Tuesday of each month with a few exceptions such as in July. More information about the Board of Directors, meeting schedule, and more can be found on the SMCAS website:

<http://www.smcasastro.com/board-of-directors.html>

Happy stargazing! I hope to see you at one of our next events, particularly the April meeting where we have an outstanding speaker: Dr. Adrian Liu from UC Berkeley presenting on the topic: Watching Our Universe Grow Up: Radio Snapshots Through Cosmic Time.

Marion Weiler

President, San Mateo County Astronomical Society

Dr Adrian Liu

Hubble Fellow

Department of Astronomy, UC Berkeley

Watching Our Universe Grow Up: Radio Snapshots Through Cosmic Time

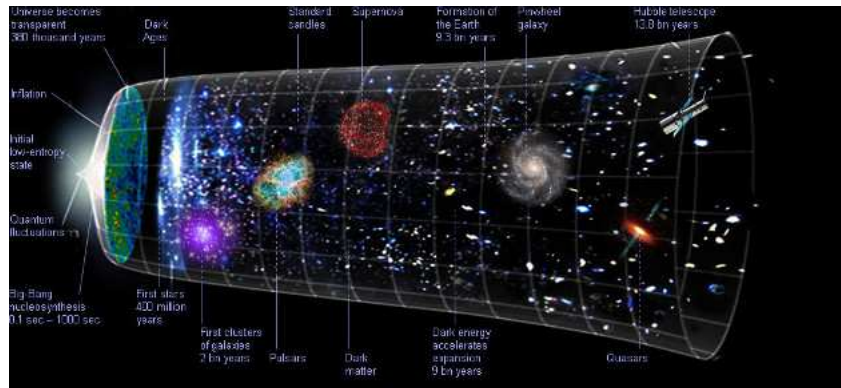
Friday, April 6, 2018, College of San Mateo, Building 36

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)

How did the first generation of stars and galaxies form in our Universe? Astronomers don't know. We have ideas, to be sure, but they're hard to confirm with observations because prior to the formation of the first stars and galaxies, it's not clear what we can look at! In the last few



years, much progress has been made in trying to detect radio waves from hydrogen atoms that existed in the early Universe. The existence of hydrogen precedes the formation of the first stars and galaxies, and therefore allows direct observations of the formation process. This new technique (known as “21cm cosmology”) has yet to become a standard tool in the astronomical community. In this talk, Dr Liu will provide a “sneak preview” of what will come in the next few years, as 21cm cosmology revolutionizes our understanding of how our present Universe—with its majestic astronomical patterns consisting of mature stars, galaxies, and even larger objects—came to be.



Dr Liu is a cosmologist working on the boundary between theory and observations in 21 cm cosmology. By using data from a new generation of radio telescopes, he seeks to understand how the first stars and galaxies formed, with the eventual goal of mapping an unprecedentedly large volume of our observable Universe.

March Meeting Review

Enceladus: A Moon of Saturn with a Life of Its Own?

By Ken Lum

Enceladus, an icy moon of Saturn, is shaping up to be a significant target of NASA's search for life in the solar system. At only 500 km (310 mi) diameter, this moon is only 1/10th the size of Saturn's largest moon, Titan. Enceladus orbits Saturn rapidly every 32.9 hrs in a 2:1 orbital resonance with Dione which orbits in a higher orbit. In other words, Enceladus performs two orbits for every one of Dione. This resonance, along with the gravity of Saturn, results in tidal deformation of Enceladus leading to heating of its interior. This heating warms a subsurface ocean found by the Cassini spacecraft in 2005 to be spewing over 100 water geysers into space from fractures on the moon's south pole [1] (Fig. 1).

With a source of heat and water geysers, astrobiologists began speculating that this could be an opportunity to readily sample water from Enceladus for biomarkers of extraterrestrial life. This could be done by flying a spacecraft through the geyser plumes that was specifically designed to detect those biomarkers in them. Dr. Chris McKay of NASA Ames, who is part of the planning effort, came to our March meeting to describe what such a mission might look like [2] (Fig. 2).

The Cassini mission's instruments found that the geyser plumes consist of microparticles of water ice and silica nanoparticles eroded from the rocks of the moon. These have been found to be the source of material replenishing Saturn's rarefied outermost E ring. Also found was an abundance of molecular hydrogen which could serve as a source of energy for microscopic life as well as a mix of volatile gases, water vapor, carbon dioxide and carbon monoxide, and organic materials. But Cassini was not equipped

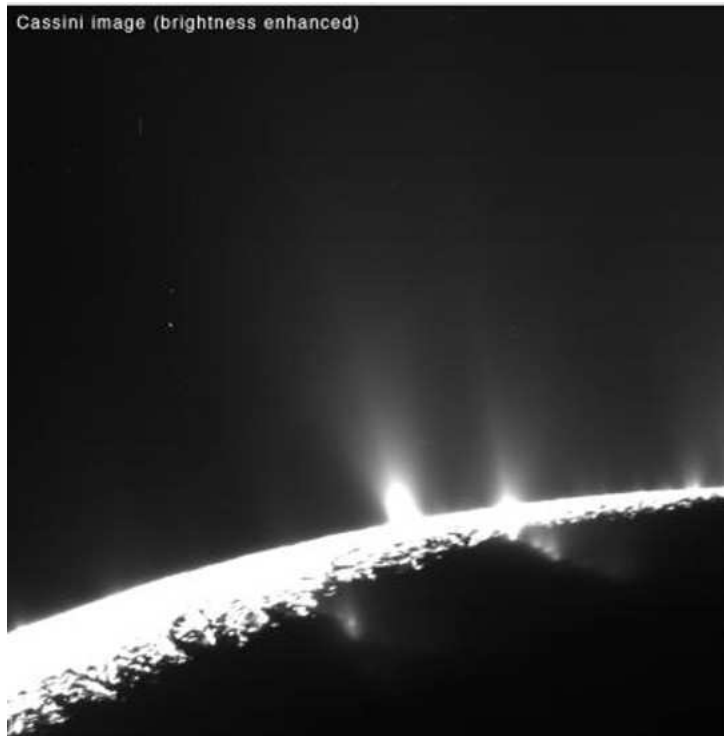


Figure 1. Water geysers on the surface of Enceladus as seen from NASA's Cassini mission.

to look for specific chemical biomarkers of life. Hence, the need for a return mission with instruments to accomplish this task.

Sought-after biomarkers of life could include the detection of a consistent chirality in amino acids. Amino acids, which make up proteins, can display either left handed (L-isomers) and right handed (D-isomers) chiral forms in the geometry of their molecules (chirality). But those used in the proteins of living organisms on Earth come only as L-isomers. So, the biochemical processes of protein synthesis we are familiar with selectively uses only L-amino acids. The discovery of only one isomer chiral form of amino acids in a sample would strongly suggest that living organisms could be responsible for this

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Enceladus, continued from p. 4

finding. Indeed, the discovery of only D-isomers of amino acids in a sample would very specifically favor an independent extraterrestrial origin of life on Enceladus separate from the origin of life on Earth where L-isomer amino acid forms predominate.

Another biomarker could be the finding of specific types of lipids in a sample. On Earth lipids found in biological organisms often have specific characteristics not found in lipids of non-biologic origin. The discovery of life-specific lipids in a sample could indicate the presence of life on Enceladus. In addition, the discovery of complex long chain molecules would also be strong evidence for the existence of life.

The existence of specific atomic isotopes of carbon and other elements could also be a biomarker. For example, biochemical processes usually prefer lighter isotopes because lighter isotopes generally have weaker bonds, which are preferentially broken in biological metabolism. Thus, the resulting biomass is enriched in the lighter isotope compared to the heavier isotope in many biological processes.

One current effort to build a probe to look for biomarkers in Enceladus's geyser plumes is called the Enceladus Life Signature and Habitability (ELSAH) mission, of which Dr. McKay is the principal investigator [2]. It is a medium sized mission that is part of the New Frontiers family of missions. To detect some of the proposed biomarkers will require the spacecraft to have a camera, an infrared spectrometer and other instruments to look for the biomarkers listed above. They have at least received funding to develop the detector technologies that would be needed both on this mission and other similar



Figure 2. Dr. Chris McKay of NASA Ames with Ken Lum.

missions in the future to look for evidence of exobiology. Other similar missions are also currently under consideration [3]. Even the private sector is considering a mission called Breakthrough Initiative [4].

It is not yet clear as to whether a sample return mission is in the works or if all the sample analysis will be done *in situ* at Enceladus. Both approaches have their pros and cons, as Dr. McKay explained.

References

1. en.wikipedia.org/wiki/Enceladus
2. en.wikipedia.org/wiki/Enceladus_Life_Signatures_and_Habitability
3. www.nytimes.com/2017/09/15/science/saturn-cassini-return.html
4. www.space.com/38741-alien-life-search-enceladus-breakthrough-initiatives.html

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.

Fri, Apr 6	7:00 pm	General Meeting, Pizza Social and Presentation
Sat, Apr 14	7:45 pm	Crestview Park Star Party
Tue, Apr 17	7:00 pm	SMCAS Board Meeting
Fri, Apr 20	7:30 pm	Presentation by Mohsen Janatpour. Evolution of Symvisio: From Form to Feeling. CSM Theater. See p. 7.
Sat, Apr 21	7:45 pm	Crestview Park Star Party
Fri, May 4	7:00 pm	General Meeting, Pizza Social and Presentation
Sat, May 5	8:00 pm	Crestview Park Star Party
Sat, May 12	8:00 pm	Crestview Park Star Party
Tue, May 15	7:00 pm	SMCAS Board Meeting

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.

Associated Students and the Math/Science Division of College of San Mateo present

Professor Mohsen Janatpour's Lecture & Art Exhibition

on

Evolution of Symvisio: From Form to Feeling

Friday, April 20, 2018 • 7:30 pm • College of San Mateo Theatre
Admission FREE, Reception following

31st Presentation of Art & Science

"Art is the creation of forms symbolic of human feeling", wrote one of my favorite philosophers of art, Susanne Langer. In this thirty-first Presentation of Art and Science, I would like to unpack this statement in the context of my symvisio compositions. In particular, I will discuss the making of Symvisio XII.

We will complete the evening by setting up telescopes in front of the theatre, courtesy of the San Mateo County Astronomical Society and CSM Astronomy department. With help from the experts, you will be treated to the spectacular view of celestial beauties.

Beethoven parking lots C, D, E
are closest to the event
See campus map at
collegeofsanmateo.edu/map

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College of San Mateo

Measuring the Movement of Water on Earth

By Teagan Wall

As far as we know, water is essential for every form of life. It's a simple molecule, and we know a lot about it. Water has two hydrogen atoms and one oxygen atom. It boils at 212° Fahrenheit (100° Celsius) and freezes at 32° Fahrenheit (0° Celsius). The Earth's surface is more than 70 percent covered in water.

On our planet, we find water at every stage: liquid, solid (ice), and gas (steam and vapor). Our bodies are mostly water. We use it to drink, bathe, clean, grow crops, make energy, and more. With everything it does, measuring where the water on Earth is, and how it moves, is no easy task.

The world's oceans, lakes, rivers and streams are water. However, there's also water frozen in the ice caps, glaciers, and icebergs. There's water held in the tiny spaces between rocks and soils deep underground. With so much water all over the planet—including some of it hidden where we can't see—NASA scientists have to get creative to study it all. One way that NASA will measure

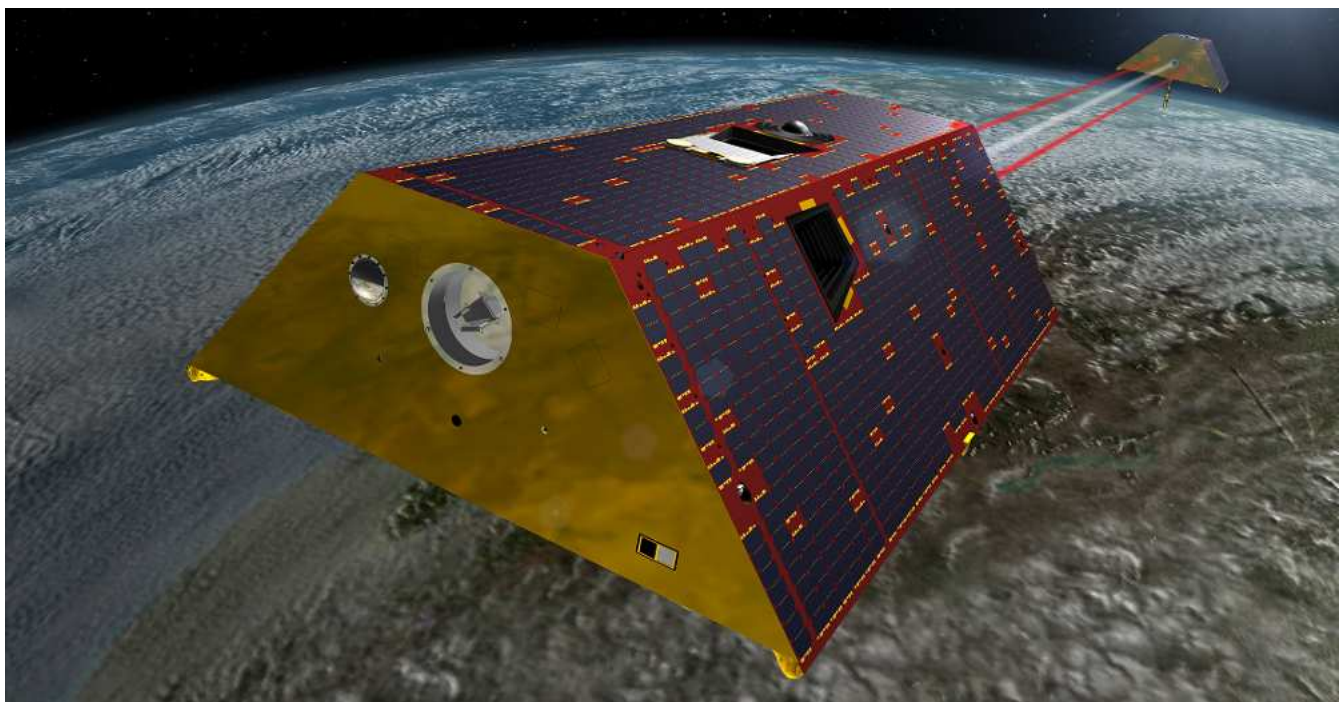
where all that water is and how it moves, is by launching a set of spacecraft this spring called GRACE-FO.

GRACE-FO stands for the "Gravity Recovery and Climate Experiment Follow-on." "Follow-on" means it's the second satellite mission like this—a follow-up to the original GRACE mission. GRACE-FO will use two satellites. One satellite will be about 137 miles (220 km) behind the other as they orbit the Earth. As the satellites move, the gravity of the Earth will pull on them.

Gravity isn't the same everywhere on Earth. Areas with more mass—like big mountains have a stronger gravitational pull than areas with less mass. When the GRACE-FO satellites fly towards an area with stronger gravitational pull, the first



Continued on p. 10



An artist's rendering of the twin GRACE-FO spacecraft in orbit around Earth. Credit: NASA.

April Rise and Set Chart

SMCAS 2018 (PDT)		Apr 14 Rise	Apr 14 Set	Apr 21 Rise	Apr 21 Set
Sun		6:34 AM	7:44 PM	6:24 AM	7:50 PM
Moon		6:10 AM	6:30 PM	11:15 AM	1:02 AM
Mercury	Before sunrise	5:49 AM	6:02 PM	5:32 AM	5:42 PM
Venus	After sunset	7:41 AM	9:38 PM	7:39 AM	9:54 PM
Mars	In the wee hours	1:59 AM	11:31 AM	1:46 AM	11:20 AM
Jupiter	Late evening	9:43 PM	8:04 AM	9:12 PM	7:34 AM
Jupiter's moons		g j i e c		c g j i e	
11 PM, East on left		J=Jupiter, c=Callisto, e=Europa, g=Ganymede, i=Io			
Saturn	In the wee hours	1:29 AM	11:07 AM	1:01 AM	10:40 AM
Uranus	In the sun's glare	6:49 AM	7:57 PM	6:22 AM	7:32 PM
Neptune	Before sunrise	5:04 AM	4:27 PM	4:37 AM	4:00 PM
Pluto	In the wee hours	2:18 AM	12:02 PM	1:50 AM	11:35 AM

- Star parties are at Crestview on the 14th and 21st.
- Jazz Under the Stars is at CSM on the 21st.

- *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.

April 2018						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
01 7:31 PM Sunset	02	03	04	05	06 7:00 PM General Membership Meetin	07
08 7:37 PM Sunset	09	10	11	12	13	14 7:45 PM Crestview Star Party
15 7:43 PM Sunset	16	17	18	19	20 7:30 PM Art and Science Presentat	21 7:45 PM Crestview Star Party
22 7:50 PM Sunset	23	24	25	26	27	28
29 7:56 PM Sunset	30	01	02	03	04 7:00 PM General Membership Meetin	05

[observing event](#)
[club event](#)
[community event](#)

Calendar courtesy of Ed Pieret

Measuring Water on Earth, continued from p. 8

satellite will be pulled a little faster. When the second GRACE-FO satellite reaches the stronger gravity area, it will be pulled faster, and catch up.

Scientists combine this distance between the two satellites with lots of other information to create a map of Earth's gravity field each month. The changes in that map will tell them how land and water move on our planet. For example, a melting glacier will have less water, and so less mass, as it melts. Less mass means less gravitational pull, so the GRACE-FO satellites will have less distance between them. That data can be used to help scientists figure out if the glacier is melting.

GRACE-FO will also be able to look at how

Earth's overall weather changes from year to year. For example, the satellite can monitor certain regions to help us figure out how severe a drought is. These satellites will help us keep track of one of the most important things to all life on this planet: water.

You can learn more about our planet's most important molecule here:

spaceplace.nasa.gov/water.

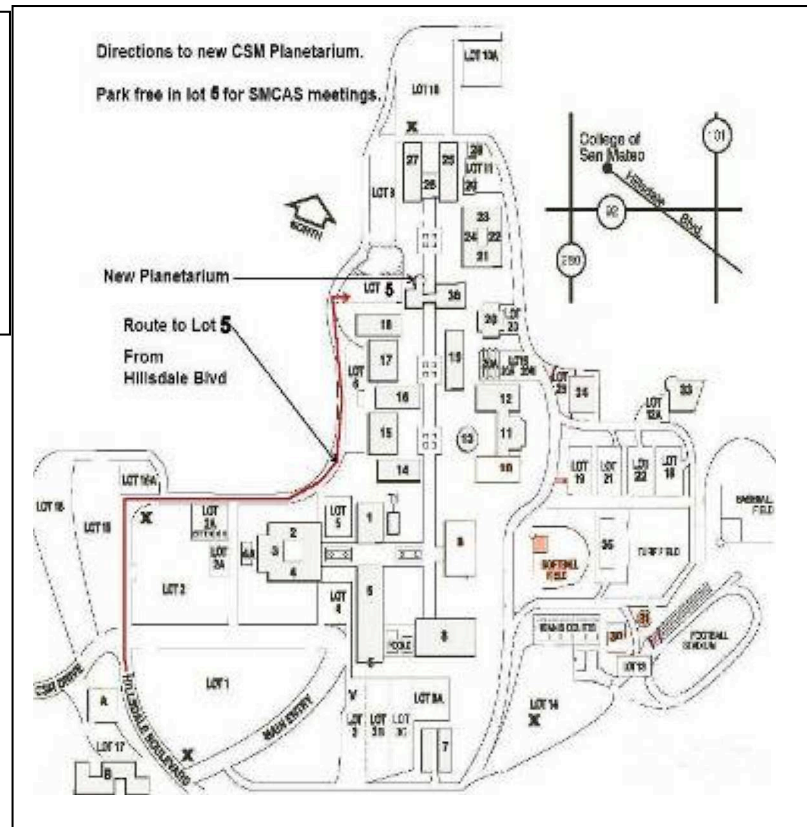
This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!

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>