

The SAN MATEO COUNTY ASTRONOMICAL SOCIETY

January-February-March, 2019 Issue: 658th General Meeting Notice: March 1, 2019
657th General Meeting Held on February 1, 2019



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 membership information is found here: <http://www.smcasastro.com/membership.html>, where those who want can join via PayPal. Membership also 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.



Twenty-three SMCAS members toured SLAC National Accelerator Laboratory's latest astrophysics and cosmology projects in February. Board Member and tour organizer Bill Lockman (front) has a complete report starting on page 7.

Upcoming March, 2019 Dates:

Friday, March 1, 2019, 7 pm –10 pm: General meeting, Pizza and Presentation, Page 10

Saturday, March 2, 2019, 6 pm –10 pm: Crestview Star Party, Page 16

Saturday, March 9, 2019, 6 pm –10 pm: Crestview Star Party, Page 16

Sunday, March 10, 2019, 2 am: Daylight Savings time begins

Saturday, March 16, 2019, 8 pm –10 pm: Jazz Under the Stars at CSM, Page 14

Tuesday, March 19, 2019, 7 pm –9 pm: SMCAS Board Meeting, CSM ISC Room 110

Saturday, March 23, 2019: Spring Equinox Party, Page 3.

President's Corner

Here we are at the end of February already.... and many of us have not yet had a chance to get out our telescopes. There has not been much friendly weather for observing, but there have been plenty of SMCAS related activities underway for CY 2019. Many of us enjoyed a great holiday party in January, which included the white elephant gift exchange. Members took a tour of the LSST camera facilities at SLAC on February 22, 2019, and we are planning a Spring Equinox party on March 23 (details will appear on our web page, SMCASastro.com). Also, SMCAS has submitted an application to host a star party at Glacier Point in Yosemite Park this summer. The window to host a party runs from early June to Labor Day and we will find out March 16th if we have been selected. Thirty members will receive free admission and camping (others can attend as well) and will be required to give a public star party, including a 30-minute presentation. The Board of Directors is looking at additional member activities for the remainder of the year. We will make announcements of new activities via our Groups.io email account to members.

I would like to ask the membership for a volunteer to take on the future publications of the SMCAS newsletter – Event Horizon. The position would participate in Board meetings and be responsible for the regular publication of the newsletter. A newsletter template has been created in MS Word and content would be submitted by various SMCAS members. The position will collect the content and insert it into the template. They will perform final editing and then email a PDF document to the SMCAS membership. Many thanks to our previous editor – Ted Jones, and to Bill Lockman for leading the transition. Please contact me directly at my email below if you are interested.

We will be having our next SMCAS party/social coming up at the Equinox in March. More details will be coming up in this issue of Event Horizon.

Finally, last month brought the end of NASA's Opportunity Rover Mission on Mars after 15 years of exploration. The original design was to last just 90 Martian days and travel 1,000 meters. Instead, it rolled for 28 miles. That is the distance from the College of San Mateo to the Golden Gate Bridge. An amazing accomplishment and engineering achievement. Perhaps, someday, it will again be touched by human hands.

Clear Skies!

Frank Seminaro

President, San Mateo County Astronomical Society

Frank.Seminaro@Yahoo.com

SMCAS Holiday and Spring Equinox Parties

By Mary Ann McKay, SMCAS Board Member

On Saturday, January 12, 2019, approximately 30 (a record, we believe) SMCAS members attended our annual holiday party at the Crystal Springs Methodist Church (Figure 1).

Everyone seemed to enjoy the entrees brought by the board and the sides brought by the other members. Instead of a talk, we did a white elephant gift exchange. Feedback has been that there was more member interaction with this

format, so we plan on doing it again next year and may repeat the post-holiday date! In particular, Izzy Cooke, our youngest member at age 12, seemed to enjoy watching the gift stealing! The most popular gifts seemed to be the two astronomy umbrellas!

We hope you will join us at our next party, the Spring Equinox Party, scheduled for Saturday, March 23, 2019, time and place to be announced on our website, SMCASASTRO.com.



Figure 1. SMCAS January, 2019 holiday party. Photo by Marion Weiler.

Blood Moon

By Chris Clare in Los Altos, CA

I waited patiently to see the total lunar eclipse on January 20, 2019. At 8:20 pm there were a few breaks in the clouds and I thought there might be hope. Finally, just before 8:30 pm, a hole in the clouds appeared just long enough for me to get my camera roughly focused and take a few quick shots. The picture taken at 8:39 pm (Figure 2) was the best. Some stars were visible to the left of the eclipsing moon. **(continued on Page 9)**



Figure 2. January, 20, 2019 lunar eclipse moments before totality. Photo by Chris Clare.

SMCAS General Meeting Talk that was Presented on February 1, 2019

Dr. Aaron Roodman

Professor, Particle Physics and Astrophysics, [SLAC National Accelerator Laboratory](#)

Fastest Eye on the Sky: [The Large Synoptic Survey Telescope \(LSST\)](#)

Friday, February 1, 2019, [College of San Mateo, Building 36](#)

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

Presentation at 8:00 p.m., [Planetarium](#)

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

What is the Universe made of? In modern cosmology only 4% of the Universe is deeply understood, while the other 96%, Dark Energy and Dark Matter, remains a mystery. The [Large Synoptic Survey Telescope \(LSST\)](#), currently under construction at [Cerro Pachón](#) (a mountaintop in northern Chile), will observe billions of galaxies, billions of stars in our own Milky Way galaxy, as well as millions of objects closer to home in the solar system. Every night over a ten-year survey, LSST will observe much of the night sky, so that every portion of the sky will be imaged nearly a thousand times. In this talk, Dr. Roodman described the LSST telescope and its remarkable set of observations, and how LSST will be able to “see” the dark portion of the Universe in unprecedented detail.



Dr. Roodman obtained his Ph.D. from the University of Chicago in 1991. He spent the next two decades in experimental elementary particle physics, seeking to understand the [asymmetry between matter and antimatter](#) in the present-day Universe. Dr. Roodman is now in [observational cosmology](#), where he studies [Dark Energy](#) using images of [galaxy clusters](#) and [weak gravitational lensing](#) from the ongoing [Dark Energy Survey](#) and the future LSST instruments. Dr. Roodman

is the system scientist responsible for the integration and testing of the [3200-megapixel LSST camera](#) at SLAC. He is a professor in [SLAC’s Particle Physics and Astrophysics faculty](#) and serves as its Department Chair. He is also a member of the [Kavli Institute for Particle Astrophysics & Cosmology](#) and previously served three years as its deputy director. He is a Fellow of the American Physical Society.



The Large Synoptic Survey Telescope (LSST)

By Ken Lum, SMCAS Board Member

One of the newest big telescope projects now underway on Cerro Pachón mountain in the Chilean Andes (Altitude: 8,737 ft.) is known as the Large Synoptic Survey Telescope (LSST). During our February meeting, Dr. Aaron Roodman of the SLAC National Accelerator Laboratory (SLAC) came to describe this revolutionary new telescope and what it is expected to do.

The purpose of the telescope is to take a series of high resolution, wide-field pictures of the entire sky visible from its location every few nights. Hence the term "Synoptic" (from Synopsis) referring to a general survey of the whole sky. In doing this, it is expected that many thousands of new and transient events will be captured by creating a high-resolution movie of the entire sky in near ultraviolet (UV) to optical to near infrared (IR) down to 27th magnitude over a period of at least ten years. This is equivalent to producing a Palomar Observatory Sky Survey every few days thereby providing a very detailed view of the dynamic Universe over

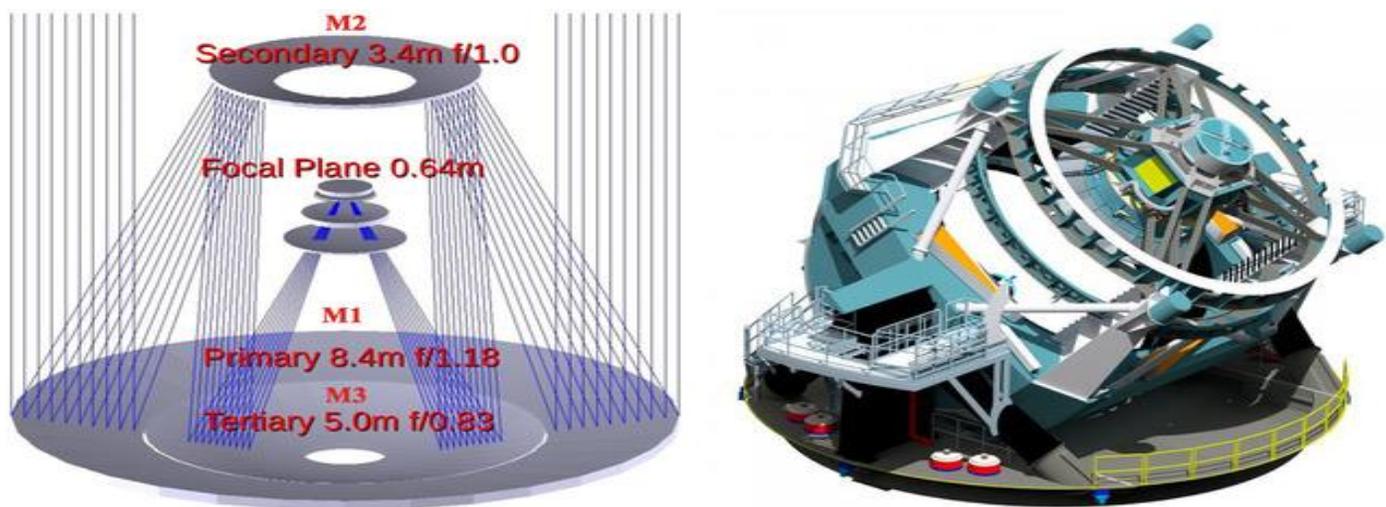


Figure 3. Left: Large Synoptic Survey Telescope light path. Right: Engineering drawing of the telescope

time.

In designing this telescope to correct for spherical aberration, coma, and astigmatism (e.g., aplanatic), the builders resorted to an unusual three-mirror design known as a Paul-Baker/Mersenne-Schmidt telescope (Figure 3) where light from a distant object in the sky is reflected off the outer ring of the 8.4 meter primary mirror (M1) up to the convex secondary mirror (M2) back down to a tertiary mirror (M3) ground into the central zone of the primary mirror. From there, the light is reflected up through some corrective lenses to the detectors in the camera located in front of the secondary mirror.

The LSST camera itself contains a 25.4-inch diameter cooled multi-CCD detector installed in a 5.5 ft. diameter x 9.8 ft. housing (Figure 4). This camera will provide imaging coverage for a

3.5° field of view (about 7 full Moon diameters) at $f/1.23$. This is the same field of view of my little Takahashi Sky 90 telescope with a 32 mm Televue Plössl eyepiece, but applied to an 8.4-meter telescope!

Dr. Roodman said that adaptive optics will not be used due to the very large field of view making this technology not applicable. Instead, image quality will be improved by using a companion device called a Differential Image Motion Monitor (DIMM) to monitor the atmosphere above the telescope for turbulence so as to develop a fluid dynamics model of the atmosphere which can be incorporated into the image data processing.

With this unique telescope, astronomers hope to:

- 1) Perform a deep census of solar system objects including Kuiper Belt Objects and threatening Near Earth Asteroids.
- 2) Do rapid surveys for transient objects such as variable stars, supernovae, gamma-ray bursters, variable quasars, and kilonovae (mergers of binary neutron stars, and neutron stars with black holes).
- 3) Do detailed mapping of the Milky Way and Magellanic Clouds.
- 4) Map the distribution of Dark Matter and refine the specifications of Dark Energy via gravitational lensing and photometry of Type 1A supernovae.
- 5) Discover new phenomena not yet anticipated.

The LSST tube assembly and dome is currently under construction in Chile and its camera is being built at SLAC. The scientific program is scheduled to begin around 2022.

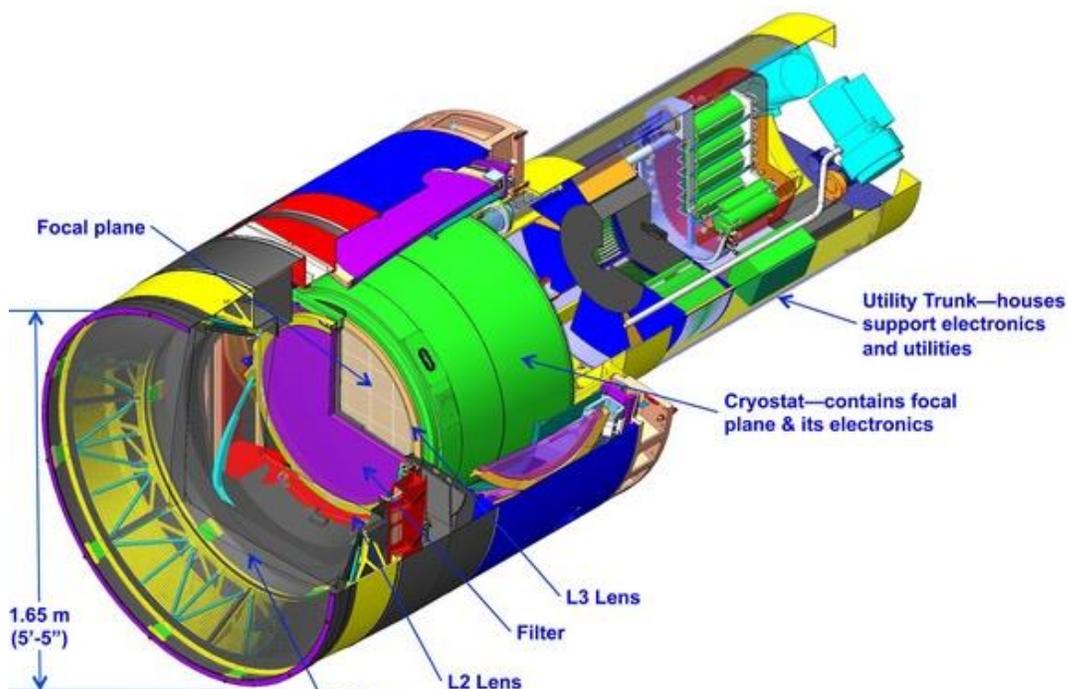


Figure 4. Cut-away view of the LSST Camera.

SMCAS SLAC Tour

By Bill Lockman, SMCAS Board Member

On Friday, February 22, 2019, 23 SMCAS club members went on a private tour of two astrophysics and cosmology projects under development at the SLAC National Accelerator Laboratory (SLAC). The tour, organized by SMCAS Board Member Bill Lockman in collaboration with SLAC scientist Mandeep Gill, included visits to the [Large Synoptic Survey Telescope \(LSST\) digital camera](#) cleanroom and the [LZ test stand](#) for the [LUX- ZEPLIN \(LZ\) Dark Matter Search experiment](#), as well as to the [Scientific Visualization and Data Analysis Laboratory \(VISLAB\)](#) at SLAC's [Kavli Institute for Particle Astrophysics and Cosmology \(KIPAC\)](#). The timing of the tour chosen to be a close follow-up to Dr. Aaron Roodman's lecture about the LSST project presented at the February 1, 2019 SMCAS General Meeting (and summarized in Ken Lum's article beginning on Page 5).

After sign-in and name tag distribution, we went to the visitor's theater and viewed a video highlighting the history of SLAC's main research areas. SLAC began as an electron- (and positron-) accelerator-based elementary particle physics laboratory starting in the early 1960s. After the last particle physics experiment ([BaBar](#)) at the laboratory stopped data-taking in 2007, SLAC re-purposed itself, primarily (and most relevantly for us) focusing on particle astrophysics and cosmology at KIPAC, [collaborating](#) on the [ATLAS experiment](#) at the [Large Hadron Collider](#) at [CERN](#), and pursuing photon science at its Stanford Synchrotron Radiation Lightsource ([SSRL](#)) and Linac Coherent Light Source ([LCLS](#)) facilities.

Next, we went to KIPAC's VISLAB, where we watched simulations of the time evolution of the Universe based on the [Standard Cosmology Model](#). These simulations indicate that the large-scale structure and dynamics of the observed Universe are sensitive to its mass-energy content: ~5% Baryonic Matter, ~25% Cold Dark Matter, and ~70% Dark Energy. Due to their abundance, Dark Energy and Dark Matter dominate the continuing evolution of the Universe. However, we presently have no direct evidence for Dark Matter particles, nor do we know what Dark Energy is, only that it might be responsible for the accelerating expansion of the Universe. Data from the LSST and LZ experiments will hopefully provide a better understanding of the Dark Sector.



Figure 5. Left: tour group viewing the LSST Camera cleanroom. Right: Interior view of the cleanroom.

Following the VISLAB activity, we peered inside the LSST class 1000 camera cleanroom through an exterior window (Figure 5). Dr. Roodman, who is in charge of the camera assembly, testing and integration into the telescope, stated that the first of the 21 “rafts” (the modular components comprising the 3.2 giga-pixel camera sensor) are currently undergoing testing. [The LSST camera is scheduled for completion and delivery to the LSST observatory in 2020.](#)

The final stop on the tour was a visit to the LZ Dark Matter Search Experiment test stand located next to the LSST cleanroom. The LZ experiment will search for the existence of a Dark Matter candidate known as a Weakly Interacting Massive Particle ([WIMP](#)) through its interaction with xenon nuclei inside the 10-ton liquid-xenon (LXe) target. The LZ experiment will be located deep underground at the Sanford Underground Research Facility in the former South Dakota Homestake Gold Mine. The LZ test stand facility at SLAC is being used for LZ detector prototyping as well as for research and development into future LXe detectors. There is also a purification test facility for determining how best to remove residual radioactive contaminants from commercial-grade LXe to maximize sensitivity to the very faint signals produced by WIMPs interacting with the LXe target nuclei. The tour of the LZ test stand facility was given by Dr. Alden Fan (Figure 6).



Figure 6. Dr. Alden Fan explaining the LZ Test Stand.

After the tour, 17 members of the group met for dinner at [El Cerrito Mexican Restaurant](#) in Menlo Park, CA (Figure 7). The food at the restaurant was superb, the prices reasonable, and the company great. This was a fitting end to an enjoyable and enlightening tour at SLAC. My thanks to Ken Lum for his great suggestion to hold a post- tour dinner at this Restaurant.



Figure 7. Tour group dinner at El Cerrito Restaurant.

(Blood Moon, continued from Page 3)

I used a Nikon Z7 mirrorless digital camera with a zoom lens. The focal length was set to 420 mm, and the exposure was 1 second, f/6.3, ISO 200. In post-processing, I pushed the exposure three stops. The clouds moved in again at 8:41 pm and it began to rain. End of show. Unfortunately, I never got to see the eclipse in full totality at 9:00 pm, nor did I have the opportunity to focus the camera carefully. – ***Chris Clare (from Los Altos, CA)***

SMCAS General Meeting Presentation, Friday March 1, 2019

Dr. Michael Busch

Research Scientist, SETI Institute

Near Earth Asteroid Hazards, Research and Space Missions

Friday, March 1, 2019, [College of San Mateo, Building 36](#)

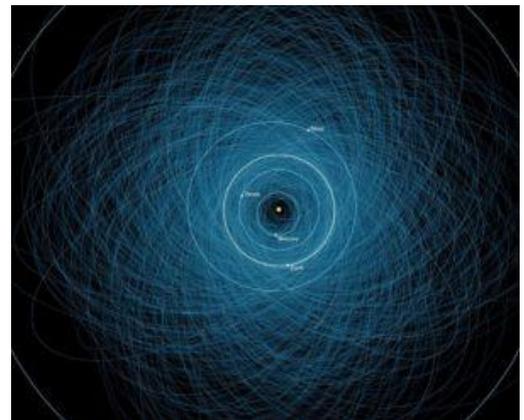
SMCAS General meeting at 7:00 p.m., ISC Room 110

Presentation at 8:00 p.m., [Planetarium](#)

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

Near-Earth Asteroids (NEAs), are a population of objects on orbit around the Sun that cross or come near that of Earth. They represent remnants of material from the early solar system that never accreted into planets. NEAs are of special interest to us because of the special risks some of them may present to Earth from collision. Join us in learning more about Near Earth Asteroids and related space missions from Dr. Michael Busch.

Dr. Busch will review the near-Earth population, as well as efforts to discover and characterize NEAs from the ground, and will also discuss past, current, and future missions to near-Earth asteroids. These include missions by NASA, ESA, JAXA, the Chinese National Space Agency, and other groups.



Dr. Busch received his BS in physics and astronomy at the University of Minnesota in 2005 and Ph.D. in planetary science at Caltech in 2010. He then did postdoctoral research at UCLA and at the National Radio Astronomy Observatory - under the Jansky Fellows program - before starting as a [research scientist at SETI](#) in September, 2013. He primarily studies near-Earth asteroids, using radio and radar techniques. He has particular interests in the shapes, spin states, internal structures, and histories of individual objects - especially spacecraft mission targets and potential Earth impactors. He also has side projects on Martian dust storms and on SETI message design.



This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.org to find local clubs, events, and more!

Springtime Planet Party

David Prosper

March brings longer days for Northern Hemisphere observers, especially by the time of the equinox. Early risers are treated to the majority of the bright planets dancing in the morning skies, with the Moon passing between them at the beginning and end of the month.

The **vernal equinox** occurs on **March 20**, marking the official beginning of spring for the Northern Hemisphere. Our Sun shines equally on the Northern and Southern Hemispheres during the moment of equinox, which is why the March and September equinoxes are the only times of the year when the Earth's north and south poles are simultaneously lit by sunlight. Exacting astronomers will note that the length of day and night on the equinox are not *precisely* equal; the date when they are closest to equal depends on your latitude, and may occur a few days earlier or later than the equinox itself. One complicating factor is that the Sun isn't a point light source, but a disc. Its edge is refracted by our atmosphere as it rises and sets, which adds several minutes of light to every day. The Sun doesn't neatly wink on and off at sunrise and sunset like a light bulb, and so there isn't a perfect split of day and night on the equinox - but it's very close!

Ruddy **Mars** still shines in the west after sunset. Mars scoots across the early evening skies from Aries towards Taurus and meets the sparkling Pleiades star cluster by month's end.

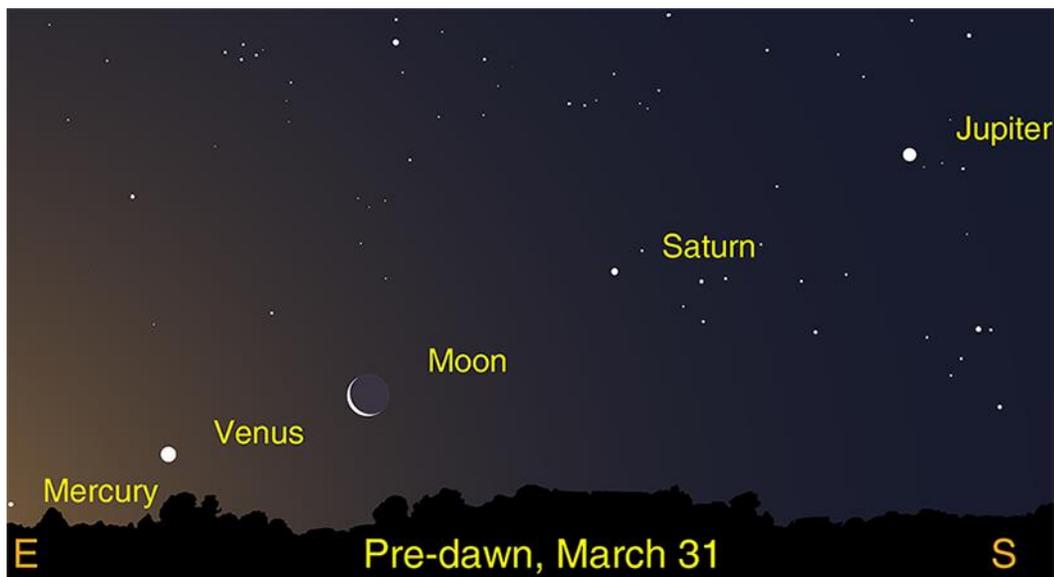
March opens with the morning planets of **Jupiter**, **Saturn**, and **Venus** spread out over the southeastern horizon before sunrise. A crescent **Moon** comes very close to Saturn on the 1st and occults the ringed planet during the daytime. Lucky observers may be able to spot **Mercury** by the end of the month. March 31 opens with a beautiful set of planets and a crescent Moon strung diagonally across the early morning sky. Start with bright Jupiter, almost due south shortly before dawn. Then slide down and east towards Saturn, prominent but not nearly as bright as Jupiter. Continue east to the Moon, and then towards the beacon that is Venus, its gleam piercing through the early morning light. End with a challenge: can you find elusive Mercury above the eastern horizon? Binoculars may be needed to spot the

closest planet to the Sun as it will be low and obscured by dawn’s encroaching glow. What a way to close out March!

Discover all of NASA’s current and future missions at nasa.gov



Caption: Earth from orbit on the March equinox, as viewed by EUMETSAT. Notice how the terminator – the line between day and night - touches both the north and south poles. Additional information can be found at <http://bit.ly/earthequinox>. Image credit: NASA/Robert Simmon



Caption: The morning planets on March 31. Image created with assistance from Stellarium

Solar System Rise- and Set times

Thanks to Ron Cardinale!

SMCAS 2019 (PST,PDT)	Mar 2 Rise	Mar 2 Set	Mar 9 Rise	Mar 9 Set	Mar 16 Rise	Mar 16 Set
Sun	6:37 AM	6:04 PM	6:27 AM	6:11 PM	7:17 AM	7:17 AM
Moon	4:33 AM	2:38 PM	8:19 AM	9:13 PM	2:25 PM	4:18 AM
Mercury	7:13 AM	7:28 PM	6:39 AM	6:58 PM	6:58 AM	7:01 PM
Venus	4:40 AM	2:43 PM	4:41 AM	2:55 PM	5:41 AM	4:08 PM
Mars	9:08 AM	10:54 PM	8:54 AM	10:50 PM	9:41 AM	11:46 PM
Jupiter	2:06 AM	11:42 AM	1:42 AM	11:18 AM	2:17 AM	11:53 AM
Jupiter's moons	g eiJ c		c g J ei		g J ie c	
4 AM, East on left	J=Jupiter, c=Callisto, e=Europa, g=Ganymede, i=Io					
Saturn	3:55 AM	1:36 PM	3:29 AM	1:12 PM	4:04 AM	1:46 PM
Uranus	8:43 AM	9:55 PM	8:16 AM	9:29 PM	8:50 AM	10:03 PM
Neptune	6:55 AM	6:20 PM	6:29 AM	5:54 PM	7:02 AM	6:27 PM
Pluto	4:14 AM	1:57 PM	3:48 AM	1:30 PM	4:21 AM	2:03 PM
<ul style="list-style-type: none"> - Star parties are at Crestview on the 2nd and 9th. - Jazz Under the Stars is at CSM on the 16th. - Daylight Saving Time starts on the 10th. 						

Jazz Under the Stars

Astronomy

Jazz Under the Stars

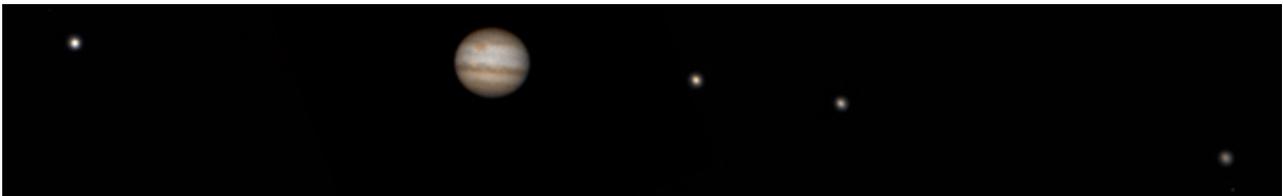
CSM Science Building 36, Rooftop Observatory

Come peer through our telescopes and see craters on the Moon, the visible planets, star clusters, and more while we listen to CSM's very own **KCSM Jazz 91 FM**. Dress warmly. Free parking in Marie Curie Lot 5. Directions are available on the [Maps, Directions & Parking](#) page.

Spring 2019 Schedule

Date	Time
February 9	Canceled due to poor weather
March 16	8:00-10:00 pm
April 13	8:30-10:30 pm
May 11	8:30-10:30 pm

This event is weather dependent. Latest [weather updates](#).



Jovian System - Chanan Greenberg, Greenhawk Observatory

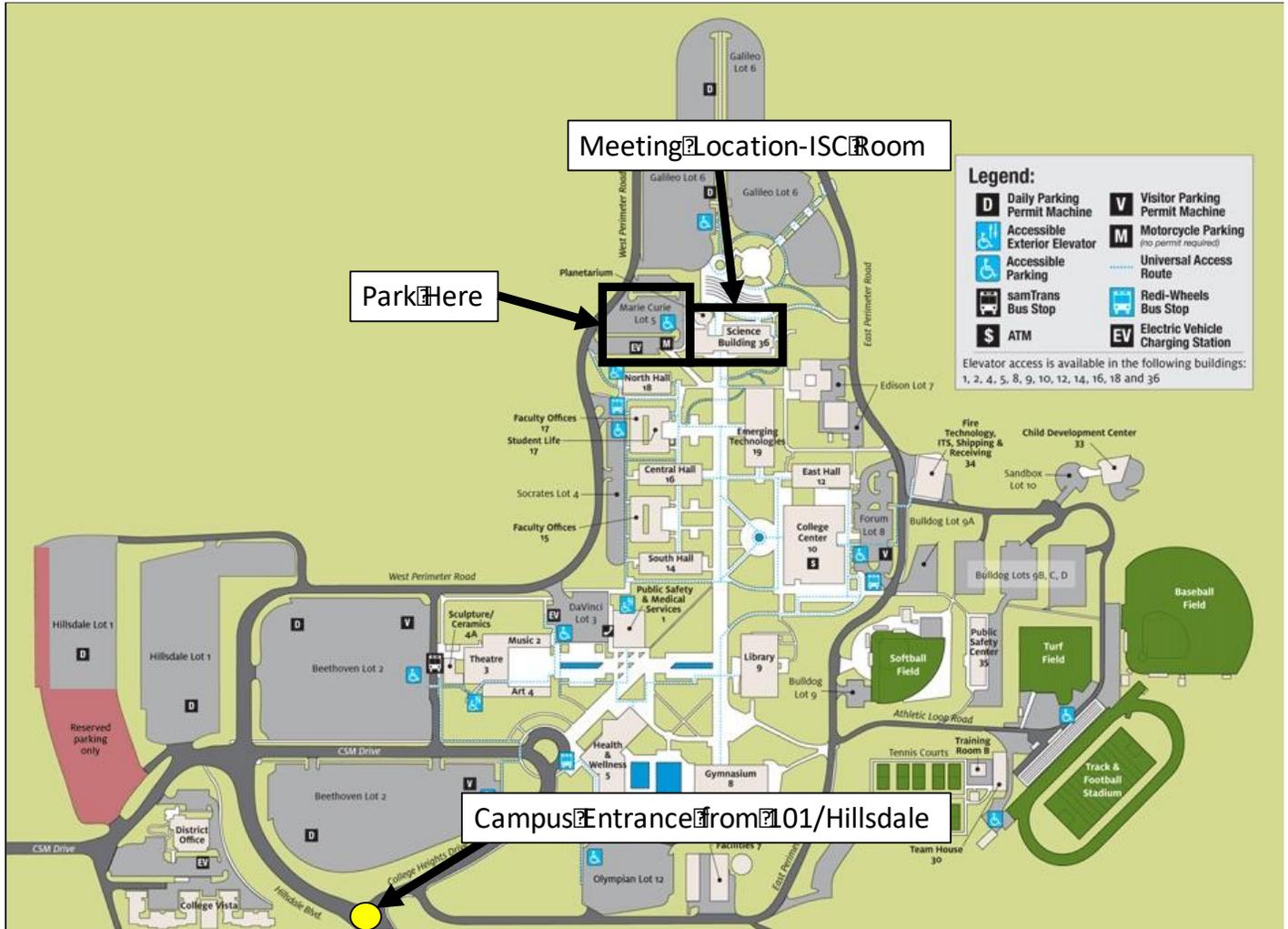
Email questions.

Listen to and support great jazz on KCSM.

No food or drinks in the observatory. Children are welcome and must be attended at all times.

Supported by [San Mateo County Astronomical Society](#), [KCSM Jazz 91.1FM](#), and [CSM Astronomy](#).
Also see [SMCAS star parties at Crestview Park](#).

Directions to SMCAS Meetings at The College of San Mateo



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 (ISC) Bldg. (36) and the planetarium lie straight ahead. Enter Bldg. 36 through the door facing the lot, or walk around the dome to the courtyard entrance.



Directions to SMCAS Public Star Parties (Weather Permitting)

Crestview Park - San Carlos

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 (toward 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.

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

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

rev 02252017

Become an SMCAS Member Today! Here's what you get:

- **Members Community**

Friendly advice and guidance from experienced recreational astronomers; access to SMCAS group emails which provide general orientation information, announcements of astronomy events, file access and exchange.

- **SMCAS Events**

General meetings are held the first Friday of most months, at 7 pm in the Integrated Science Center (ISC) Room and Planetarium in the Science Center (Bldg. 36) at the College of San Mateo (CSM), 1700 W. Hillsdale Blvd., San Mateo. Meetings include lectures and presentations on space science, an activity session, and refreshments (usually pizza).

We also offer stargazing two Saturdays a month, weather-permitting. Visitors and those without telescopes are welcome; members are glad to share! SMCAS also has sponsored dark-sky campouts at Fremont Peak State Park, field trips to SLAC, KIPAC and Lick Observatory, plus **member-only events, including Star-B-Ques and quarterly potlucks.**

- **Subscriptions** (free with your membership)

The Event Horizon, SMCAS' monthly newsletter, with SMCAS and member information, viewing tips and articles.

The Reflector, published quarterly by the Astronomical League, a national alliance of astronomy groups like SMCAS.

- **Significant Discounts on Equipment and Publications**

Discounts on purchases at Bay Area astronomical equipment retailer Orion Telescope Center, on sky calendars and ephemerides, and on such periodicals as *Sky & Telescope* and *Astronomy*.

- **Access to Loaner Equipment**

Use of SMCAS loaner telescopes and other astronomy equipment.

- **Sharing your Appreciation of Astronomy and Space Science with the General Public.**

Your SMCAS membership helps bring astronomy to interested lay people, especially students and children.

Annual Dues (SMCAS is a tax-exempt non-profit 501(c)(3). Dues may be tax deductible; consult your tax advisor)

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

Every membership includes all members of your immediate family, (including your kids).

To join you can:

- Send application (see reverse side), with payment, to: SMCAS, P.O. Box 974, Station A, San Mateo CA 94403.
- Bring the completed application and payment to a meeting or event and give it to any SMCAS officer.
- Go online at <http://www.smcasastro.com>, click on the Membership tab and pay via PayPal. **Then bring your completed application to your first meeting or mail it to SMCAS, P.O. Box 974, Station A, San Mateo CA 94403.**

Application Form on reverse side



San Mateo County Astronomical Society Membership Application

rev 02252017

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: _____