

# The SAN MATEO COUNTY ASTRONOMICAL SOCIETY

November December 2019 Issue:

663<sup>rd</sup> General Meeting Notice: December 6, 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 at <http://www.smcasastro.com/membership.html> where those who want can join via PayPal. Membership also includes access to our 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 (650) 678-2762. **Membership forms are available near the end of this newsletter beginning on page 22.**

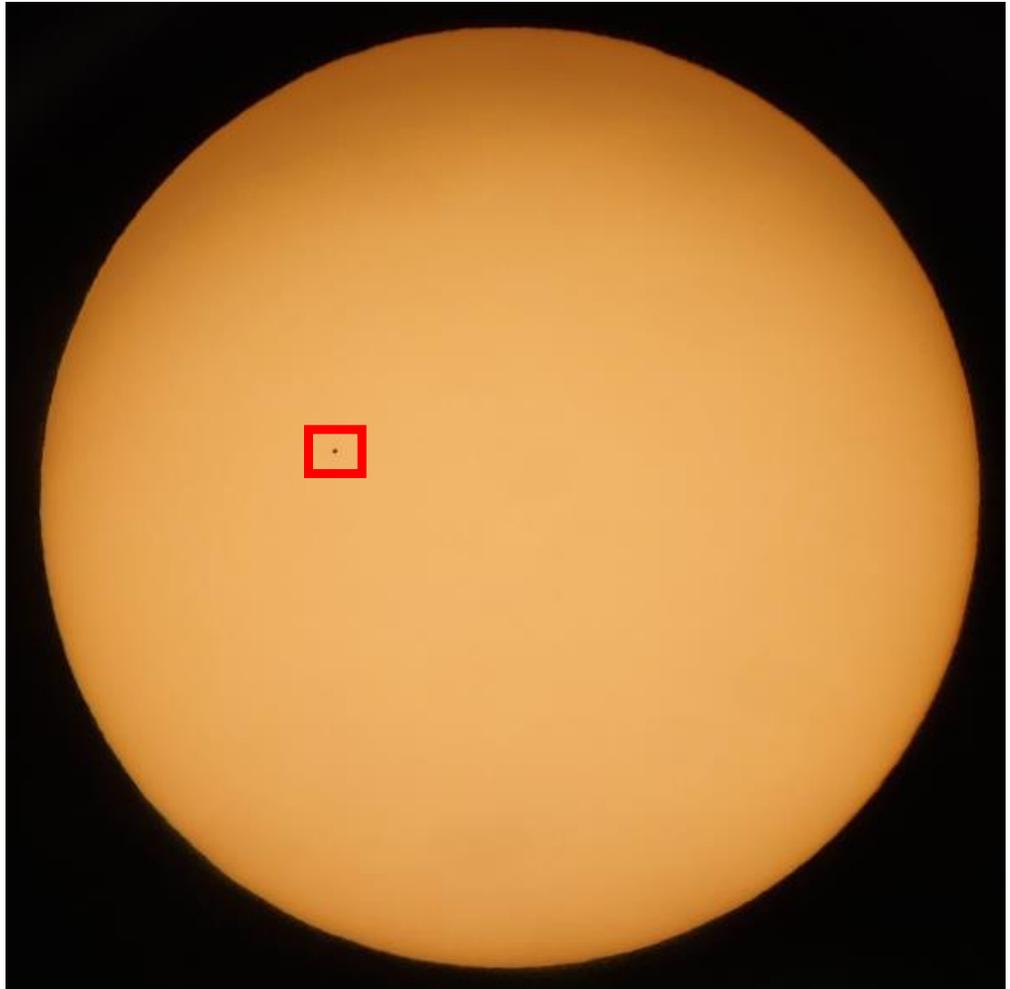


Figure 1: Photo of the November 11, 2019 planet Mercury's solar transit taken by Mike Bechler, a friend of SMCAS members Mary Ann McKay and Ed Pease. Mercury is the small disc inside the red box. More on the 2019 Mercury transit on Page 12.

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## Upcoming 2019 SMCAS Events:

**Saturday, November 30, 2019, 4:50 –9 pm:** Crestview Star Party (Page 19)

**Friday, December 6, 2019, 7 –9:30 pm:** CSM General Meeting (Page 7)

**Saturday, December 7, 2019, 5:30-7:30 pm:** [Free Stargazing at CSM Observatory](#)

**Tuesday, December 10, 2019, 5–6 pm:** Girl Scouts Family Night (Page 5)

**Wednesday, December 11, 2019, 5:15–6:15 pm:** Girl Scouts Family Night (Page 5)

**Friday, December 13, 2019, 7:30–8 pm and 8:30–9 pm:** [The Sky Tonight Planetarium Shows](#)

**Thursday, December 19, 2019, 5–6 pm:** Girl Scouts Family Night (Page 5)

**Saturday, December 21, 2019, 4:50 –9 pm:** Crestview Star Party (Page 19)

**Saturday, December 28, 2019, 4:50 –9 pm:** Crestview Star Party (Page 19)

## Solar System Rise and Set Times:

By Ron Cardinale

SMCAS 2019 (PST)	Nov 30 Rise	Nov 30 Set	Dec 21 Rise	Dec 21 Set	Dec 28 Rise	Dec 28 Set
Sun	7:04 AM	4:51 PM	7:20 AM	4:54 PM	7:22 AM	4:58 PM
Moon	10:52 AM	8:49 PM	2:23 AM	1:59 PM	9:28 AM	7:34 PM
Mercury	5:23 AM	3:53 PM	6:32 AM	4:06 PM	6:56 AM	4:21 PM
Venus	9:17 AM	6:39 PM	9:34 AM	7:20 PM	9:35 AM	7:36 PM
Mars	4:33 AM	3:14 PM	4:20 AM	2:32 PM	4:15 AM	2:19 PM
Jupiter	8:44 AM	6:15 PM	7:42 AM	5:13 PM	7:21 AM	4:53 PM
Jupiter's Moons	c e g J i		g J e c		g i J e c	
4:30 PM East on the left	J= Jupiter, c= Callisto, e= Europa, g=Ganymede, i=Io					
Saturn	9:59 AM	7:39 PM	8:45 AM	6:27 PM	8:20 AM	6:03 PM
Uranus	2:55 PM	4:19 AM	1:31 PM	2:54 AM	1:03 PM	2:26 AM
Neptune	12:58 PM	12:26 AM	11:36 AM	11:00 PM	11:09 AM	10:33 PM
Pluto	10:15 AM	7:53 PM	8:55 AM	6:33 PM	8:28 AM	6:07 PM
- Star parties are at Crestview on November 30, December 21 and December 28.						

Rise set times from <http://www.almanac.com/astronomy/rise/CA/San%20Carlos/>  
 Jupiter's moons' positions from <http://www.shallowky.com/jupiter/>

## ***President's Corner:***

Hello Friends. I want to thank the Society members who helped with our successful social and outreach events during October and November. The CSM Family Science Day and Astronomy Festival on Oct. 5th was a great success, drawing hundreds, and perhaps over 1,000 enthusiastic visitors. We had great participation from our club members and also by our fellow presenters from SLAC/KIPAC, and the keynote talk by Dr. Brian Day was so popular that there is sentiment to invite him back next year. Jazz Under the Stars was especially enjoyable with background music provided by two superb live jazz musicians. See the article on Page 13.

October 12<sup>th</sup> was our Autumnal Equinox Potluck event and, while I was indisposed with the flu, I understand a good time was had by all. See the article on Page 14.

The SLAC/KIPAC Community Day on Oct. 19<sup>th</sup> was also very popular. We were able to offer dozens of folks their own planispheres, introductions to telescope optical systems, and looks through telescopes at Jupiter and Saturn. See the article on Page 15.

Then, on November 9<sup>th</sup>, a number of us attended the Girl Scout Night Owl Badge event at Skylark Ranch, south of Pescadero, CA. There was a bright Moon, but the tree line obscured it until late. It was a rewarding event, and a good time. The girls, their counselors and escorts were very appreciative.

We have three more opportunities to support Girl Scout programs in elementary schools on December 10<sup>th</sup>, 11<sup>th</sup> (full-Moon nights, in Daly City) and 19<sup>th</sup> (in East Palo Alto). Ed Pieret is seeking volunteers with telescopes, so please check out his newsgroup emails or the article on Page 5. It's only a one-hour program in each case.

One more thing. Our newsletter, the Event Horizon, is a fine publication, and we've been fortunate to have had some excellent editors, most recently Bill Lockman, who's been doing a superb job. However, his was always a short-term stint and, he now needs to relinquish the task. So, I appeal to anyone seeking an active role in club activities to consider heading it up for a while. There's plenty of guidance available. You can follow, or alter, the form and content. Plus, we can form a Bulletin Committee, whose members can share feature preparation. Anyone interested, please contact any of us on the Board, and we would be happy to discuss what you might like to do.

Thank you all for your participation. I look forward to seeing you all at the December 6<sup>th</sup> monthly meeting.

***Mike Ryan, President, San Mateo County Astronomical Society***

[jmraastro@yahoo.com](mailto:jmraastro@yahoo.com)

## ***Announcements:***

### ***My tenure as Event Horizon editor will be ending soon:***

***Last March, 2019, I took on the task of the Event Horizon newsletter editor for one year, as agreed to by the SMCAS Board. This tenure will end with the publication of the upcoming January-March 2020 issue of the Event Horizon. The SMCAS Board will be looking for a new editor in the meantime. If you are interested, please respond to the message titled***

***"My tenure as Event Horizon editor will be ending soon"***

***In SMCAS@groups.io***

***Bill Lockman***

### ***Outreach Volunteers Needed at Upcoming Girl Scouts Family Night Events***

The Girl Scouts of Northern California are providing 12 weeks of STEM education as part of after school programs at schools in underserved communities. The Family Night is at the end of those 12 weeks and is an opportunity for the girls to show their families what they've learned.

SMCAS has been asked to help out at these events with telescopes and information about astronomy opportunities in San Mateo County. Ideally, SMCAS could provide two or three telescopes so the girls and their families can get an opportunity to see the wonders of the night sky, most for the first time.

There are three dates in December for these Family Nights in various schools in San Mateo county. The dates and schools are:

- Event Name: Girl Scouts Family Night  
Date/Time: 12/10/2019 5:00 PM - 6:00 PM  
George Washington Elementary School, 251 Whittier St, Daly City, CA  
Visitors expected: 35
- Event Name: Girl Scouts Family Night  
Date/Time: 12/11/2019 5:15 PM - 6:15 PM  
Thomas Edison Elementary School, 1267 Southgate Ave, Daly City, CA  
Visitors expected: 20
- Event Name: Girl Scouts Family Night  
Date/Time: 12/19/2019 5:00 PM - 6:00 PM  
East Palo Alto Charter School, 1286 Runnymede St, East Palo Alto, CA  
Visitors expected: 30

Conditions are not ideal. The first two events will be at a full moon and the weather in December is often a problem.

Let me know if you think that you can help out at any or all of these events. I'll need to know who is coming in order to keep volunteers informed about weather and any scheduling changes that may occur.

**Ed Pieret**

(650) 862-9602

<http://www.AstronomerEd.com/>

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### ***GalileoScopes For Christmas***

If you have a child in your life that is interested in astronomy, I have a gift for you.

SMCAS has a limited number of GalileoScopes that we have available free to members. These are in a kit form and require that the user provide a camera tripod to use.



If you are interested, please let me know by email before the December general meeting. I will bring them to the December meeting.

**Ed Pieret**

(650) 862-9602

<http://www.AstronomerEd.com/>

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### ***2019 Year End Publication Order Pickup***

I will contact those who have placed orders for any of the 2020 Astronomy Magazine Deep Space Mysteries Wall Calendar, the 2020 RASC Observer's Handbook or the RASC Explore the Universe Guide (2d ed.), letting them know that these items will be available for pickup at the SMCAS general meeting on December 6, 2019. If you cannot attend the meeting, contact me by email to make further arrangements for pickup.

**Ed Ching**

[chinged@gmail.com](mailto:chinged@gmail.com)

# ***SMCAS General Meeting and Presentation Announcement***

**Dr. Eric Nelson, Stanford University - KIPAC**

## ***Brown Dwarfs: Failed Stars or Overachieving Planets?***

*Friday, December 6, 2019, College of San Mateo, Building 36*

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

*Presentation at 8:00 p.m. Planetarium*

*Free and open to the public, free parking.*

Giant planets can be up to 13 times the mass of Jupiter, while the least massive stars are about 80 times the mass of Jupiter. In between are objects called "brown dwarfs" – too massive to be called planets, but not massive enough to burn hydrogen and shine like stars. Since 1994, a few thousand brown dwarfs have been observed close to us in the galaxy. But what are they? Are they more like half-pint cousins of stars, or more like overgrown planets? In this lecture, Eric Nielsen, a research scientist in the Kavli Institute of Particle Astrophysics and Cosmology (KIPAC) at Stanford University, will explain how we observe and study brown dwarfs and what we have learned about them. It will describe clues to their nature from their composition and their evolution over time, and the insights they give us into how stars and planets are born.



*Figure 2: Artist's conception of 51 Eridani b (Gemini Science Image).*

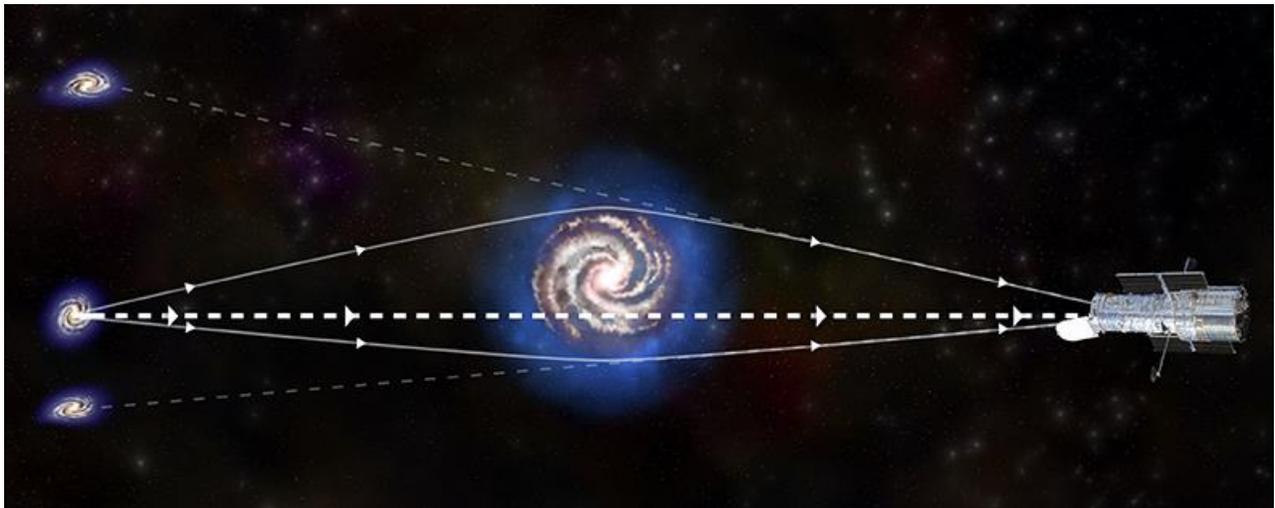
Eric Nielsen obtained his PhD in astronomy at the University of Arizona, and was a postdoctoral researcher at the University of Hawaii at Manoa and the SETI Institute. His research interests include searches for exoplanets, brown dwarfs, and the demographics of giant planets. He has collaborated in a number of planet-hunting surveys, trying to directly image giant planets around young nearby stars, including the ongoing Gemini Planet Imager Exoplanet Survey (GPIES) using the Gemini-South Telescope in Chile. This work includes the discovery of 51 Eridani b (artist's conception shown in Figure 2), a planet two-and-a-half times more massive than Jupiter. Nielsen is working to apply lessons learned from these ground-based surveys to future space-based missions that will image planets similar to Jupiter and Earth found orbiting distant stars.

# Probing Fundamental Physics with Strong Gravitational Lensing

By Ken Lum

**Gravitational lensing** is a distortion of images of background astronomical objects caused by the gravity of foreground objects that happen to be in line of sight. This is due to the ability of gravity from material bodies to bend light as predicted by Einstein's Theory of General Relativity (Figure 3). This is analogous (but not identical) to the way optical lenses bend light.

Last month, **Dr. Simon Birrer** of the **Stanford Linear Accelerator Center** generously came to describe how this peculiar physical phenomenon has been used to investigate astronomical observations.



*Figure 3: An image of a background galaxy (left) that has been distorted into two images by the gravity of a line-of-sight foreground galaxy (center) as seen by a telescope (right) (NASA).*

The ability of gravity to bend light had been predicted from Newton's theory of gravity, but the more correct interpretation that is used today comes from Albert Einstein's **General Theory of Relativity (1915)**. When he proposed the effect, he thought it would be so small that it might never be observed. However, as soon as 1919, Sir Arthur Eddington observed the positional displacement of stars observed around the Sun during a total solar eclipse blocking out the Sun and allowing adjacent background stars to be photographed and measured.

Other lensing effects caused by the gravitational bending of light were proposed in the ensuing years. But the actual observation of a lensing event was not until 1979 when the **twin quasars QSO 0957+561A/B** were imaged from **Kitt Peak National Observatory**. The **Hubble Space Telescope** image of the same objects below (Figure 4) shows both quasar images along with the lensing foreground galaxy. This result is consistent with the lensing mechanism of what is really a single background quasar illustrated in Figure 3 above.



*Figure 4: HST image of the twin quasar QSO 0957+561A/B along with the lensing galaxy producing the two images (NASA and Dr. Birrer).*

### ***Types of Gravitational Lensing:***

Dr. Birrer spoke entirely about **Strong Lensing** during his lecture. But there are actually three types of lensing that have been discovered and used.

**1. Strong Gravitational Lensing:** Lensing producing visible distortions such as multiple images, arcs, Einstein crosses and rings that are easily visible.

**2. Weak Gravitational Lensing:** Much weaker lensing phenomena that are not as obvious but are detected through statistical sampling of the orientations of the images of many objects to see if there is a shared orientation. This is used extensively to map the distribution of dark matter.

**3. Microlensing:** This is gravitational lensing due to foreground objects of small angular size passing in front of other objects of small angular size. Distorted images are typically not seen, but the background objects brighten up making them easier to detect. This method is used to detect small galactic objects such as stars, exoplanets, neutron stars, brown dwarfs, white dwarfs, black holes, etc.

### ***Types of Gravitational Lensing images:***

How a gravitationally lensed image looks to us at the receiving end depends on the shape of the lensing object and the nature of the alignment (Figure 5). The lensing effect magnifies the image as if it were a supplemental telescope.

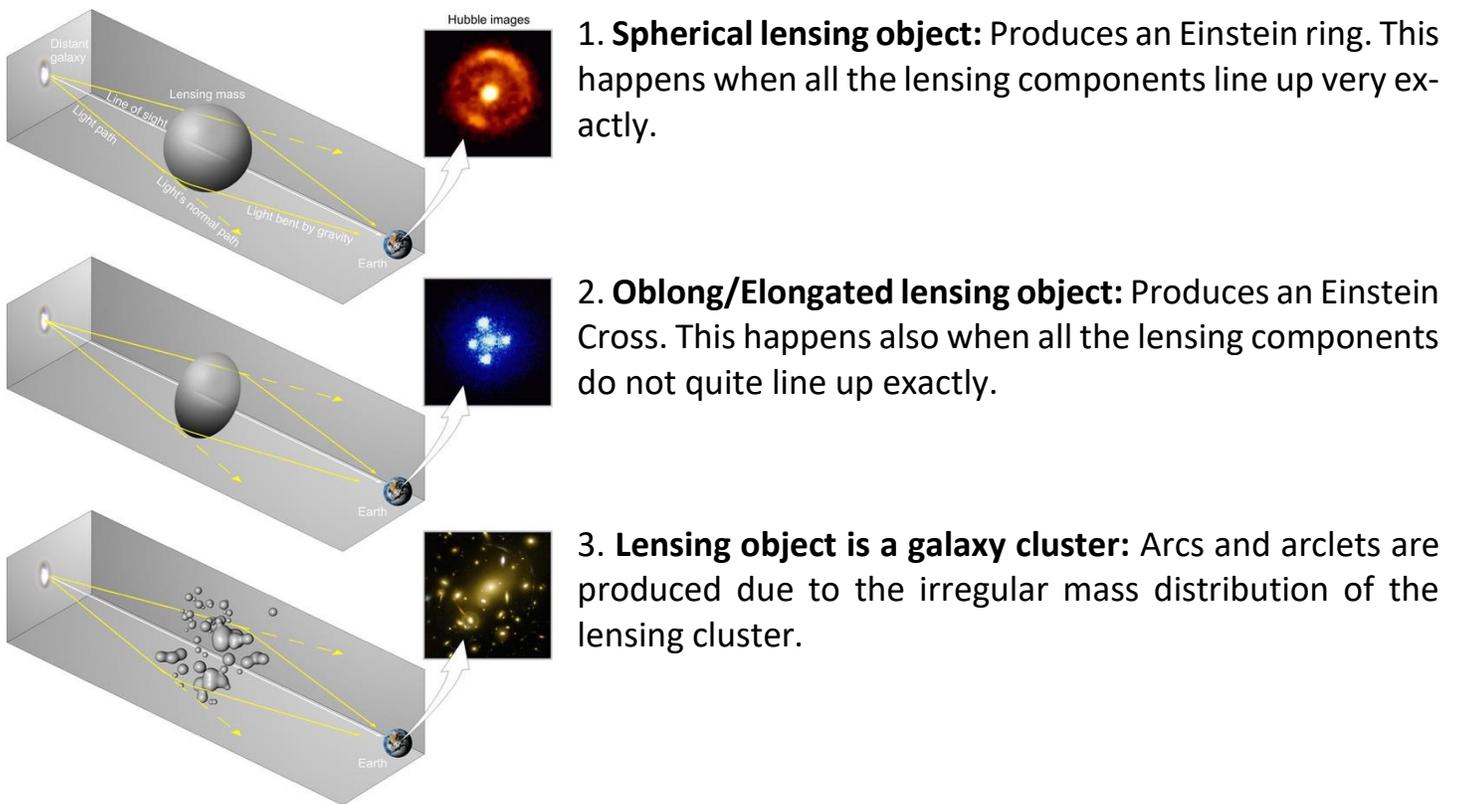


Figure 5: Gravitational lens image types (NASA/HST/ESA).

### ***Surveys Looking for Gravitational Lensing:***

Gravitational lensing takes place with all frequencies of electromagnetic radiation. Most lensing alignments have been found accidentally on images taken for other purposes. Surveys deliberately looking for lensing alignments have been done in radio waves and are ongoing. The **Dark Energy Survey (DES)** is using the **Cerro Tololo Inter-American Observatory** to look for lensing objects in the southern hemisphere. No doubt the **Large Synoptic Survey Telescope (LSST)** will find many new ones once it is operational. Optical microlensing surveys such as the **MACHO** survey have found evidence suggesting numerous exoplanets around many stars.

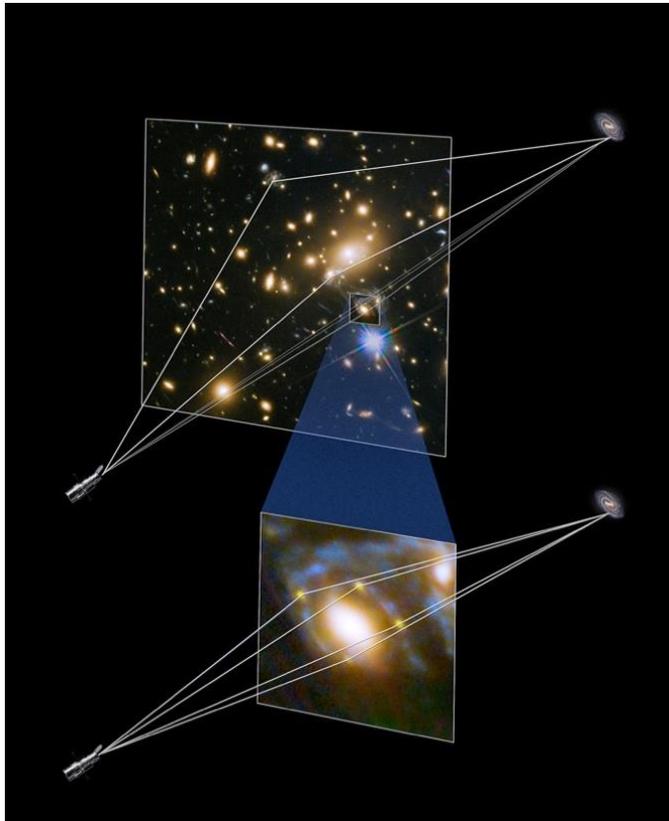
### ***Gravitational Lensing Applications:***

Gravitational lensing is being widely elaborated into a powerful technique to investigate many astronomical problems. Here are some that are in progress or being proposed:

- 1. Determination of Galaxy and Galaxy Cluster Masses**
- 2. Mapping Dark Matter Distribution**
- 3. Searching for Exoplanets**
- 4. Refinement of the Hubble Constant ( $H_0$ )**

**5. Very Distant Supernova Search:** Dr. Birrer discussed the discovery of a distant supernova in 2015 being lensed by a foreground elliptical galaxy in the galaxy cluster **MACS J1149.6+2223** into a four-image Einstein Cross (Figure 6). The galaxy cluster is estimated to be at 5 billion ly distance while the supernova, named **SN Refsdal** and **MACS J1149 Lensed Star 1**, was at 9.3 billion ly when the detected light was emitted.

This made this supernova the most distant individual star ever detected at that time. The several images are arriving at different times due to the different paths of the light beams traveling through clumpy lensing dark matter in the cluster.



*Figure 6: Gravitationally lensed supernova images forming an Einstein Cross around a lensing galaxy (NASA)*

More recently in 2017, a Type 1a supernova was discovered through lensing via the galaxy cluster, **MOO J1014+0038**.

**6. Detection of the Most Distant Galaxies and Supermassive Black Holes:** The recent imaging of the supermassive black hole in the center of the M87 galaxy is a dramatic demonstration of how black holes are gravitational lensing objects.

# 2019 Mercury Transit

By Bill Lockman



Figure 7: Isy and Michael Cooke with KTVU reporter.  
Photo Lisa Cooke.

On the morning of November 11, 2019, the sun, the planet Mercury and the Earth were aligned such that Mercury's disc appeared to travel across, or transit the Sun. You would think such an event would occur frequently. This would be true if the orbits of Mercury and the Earth were coplanar. However, the orbit of Mercury is inclined  $7^\circ$  to the ecliptic and intersects Earth's orbital plane at two nodes. The first node occurs around May 8<sup>th</sup> and the second around November 10<sup>th</sup>. If Mercury happens to pass through either of these two nodes within a few days of the nodal date, a transit will occur. The 2019 transit began

at 4:35 AM PST well before sunrise, and was therefore a partial transit as viewed from the Bay Area. The transit ended at 10:03 AM PST. The 2019 Mercury transit visibility map is shown [here](#).

SMCAS members Mary Ann McKay and Ed Pease joined their friend Mike Bechler to view the Mercury transit from Arastradero Park in the foothills of Palo Alto, CA. Mike used an Orion 150 mm aperture Maksutov Cassegrain together with a white-light solar filter and a Samsung Galaxy S10e phone to produce the photo shown in Figure 1.

SMCAS members Ted Jones and the Cooke family viewed the Mercury transit from the Chabot Space and Science Center using Chabot's historic 8" Alvan Clark refractor telescope, "Leah." Michael and Isy Cooke were also interviewed there by KTVU (Figure 7).

As arranged by CSM staffer Justin Stevick, several other SMCAS members including Marion Weiler, Ed Pieret and Ken Lum viewed the 2019 Mercury transit from the CSM observatory (Figure 8).

Presently, the frequency of Mercury transits is about 13-14 per century. The next Mercury transit visible in the San Francisco Bay Area will be a partial transit taking place on May 7, 2049.

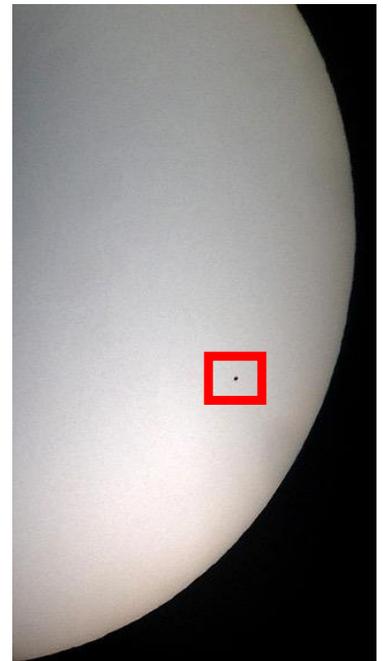


Figure 8: Mercury transit photo recorded at CSM Observatory by Dean Drumheller. Mercury is the small disc inside the red box.

# *CSM Family Science and Astronomy Festival + Makerspace*

**By Ed Pieret**

Family Science & Astronomy Festival + Makerspace for 2019 was held on October 5<sup>th</sup>. This festival has become an annual event and SMCAS plays a vital role in planning and supporting it. This year we had several thousand visitors, mostly families with children.

This event grew out of Astronomy Day, which SMCAS has celebrated for over 20 years. In 2007 we were asked to allow other science departments from CSM to participate and it became a more generalized event, although with a major emphasis on astronomy. Not only do we have astronomy exhibits, there is Solar viewing, hourly planetarium shows, a well-known astronomer as the Keynote speaker and evening stargazing at the CSM Observatory.

One frustration is that we have a limited number of members willing to help out at these events. We have far more presentation material than members to present it. We are very grateful for all the volunteers who did participate but would appreciate other members stepping forward next year.

A few photos taken by the official CSM photographer (Figure 9) should help show how much fun it is to participate. All of the photos taken by CSM's official photographer can be viewed at: <https://www.flickr.com/gp/collegeofsanmateo/BU1U14>



*Figure 9: Family Science & Astronomy + Makerspace activities.*

## ***SMCAS Fall Equinox Party***

**By Bill Lockman**

The Fall Equinox Party was held on Saturday, October 12, 2019 at the Crystal Springs Methodist Church beginning at 6 pm. The date was chosen to be near the first full moon after the Fall Equinox, so as not to conflict with Crestview Star Party dates, or the other outreach events going on in October. Though billed as a members-only event, attendees were encouraged to bring guests interested in joining the club.

This year, the attendance was a bit lower than at previous events, partially due to people being ill or traveling. Marion Weiler was out of town, Bob Franklin was hospitalized with a stroke, Mike Ryan had a respiratory ailment and Galina Sokolova was under the weather. I estimated that 18 to 20 members were present at some time during the evening, compared with 24-26 attendees at previous Equinox/Christmas parties.

The event was potluck, and as usual, there was plenty of delicious food and soft drinks available, not to mention great camaraderie and lots of star-talk, Figure 10.

Stay tuned for our upcoming Winter Star Party coming up in January, date and time to be announced on the calendar here: <http://smcasastro.com/>.



*Figure 10: Subset of attendees at Fall Equinox Party.*

## SLAC/KIPAC Community Day

By Bill Lockman

Astronomy outreach is one of the primary SMCAS activities called out in its charter. Outreach involves spreading knowledge and appreciation of the universe around us, and exciting young folks about science, especially astronomy. In addition to sponsoring Crestview star parties (Page 19), SMCAS also interacts with schools and organizations, such as scouting, to provide kids and adults alike the opportunity to view the heavens through a telescope. Many of the kids have never had the opportunity to look through a telescope, but once they have glimpsed the rings of Saturn, the bands of Jupiter, or bright deep sky objects such as the Lagoon Nebula, the response is usually an astounding “wow!”

SMCAS’s participation in yearly activities such as Community Day at SLAC is the perfect opportunity to provide astronomy outreach to families of the SLAC/KIPAC community who are likely knowledgeable about basic science, but may not have had any direct experience with amateur astronomy.

This year, over 2000 people attended Community Day which took place on October 19<sup>th</sup> from 5 to 9 pm. SMCAS provided 15 volunteers to staff the following activities: Stargazing (10 volunteers, 6 telescopes); Constructing a Planisphere (3 volunteers); How a Telescope Works (3 volunteers); Explaining the Solar System (2 volunteers). Some of the volunteers participated in more than one activity.

We acquired a new club member and volunteer: Dan Wright, who brought his 16” Albert High Dobsonian telescope to the stargazing activity. This instrument garnered a lot of attention from the participants, who are seen looking through it in daylight viewing (away from the setting sun, Figure 11). You can also see volunteer Tina Cartaro with her 70 mm refractor at left center in this photo. Several of us (myself, Wolf Witt and



*Figure 11: Dan Wright (center) demonstrating his 16” Dobsonian in daylight viewing. Photo Vikas Kapur.*

Rachel Freed) brought our 8" Schmidt Cassegrain telescopes (SCT). Darel Chapman employed his 10" SCT. Ed Ching brought his AstroScan, telescope.

The late start time of Community Day precluded solar viewing by volunteer Wolf Witt and others. And despite all the clear, dry weather we had during much of October, we had broken clouds and high humidity to deal with. Despite this, the seeing conditions were surprisingly good, and we were able to provide good views of Jupiter and Saturn for the attendees. While the two bright planets were easily visible, the ambient lighting in the telescope area precluded seeing all but the brightest deep sky objects.

Our indoor events, constructing Planispheres (Figure 12), demonstrating how telescopes work and explaining the solar system (Figure 13) all took place in and around a large conference room on the second floor of the Science and User Support Building (SUSB). The signage on the first floor of the SUSB pointing to our activities could have been better. Last year, our indoor activities were held in a room on the first floor of the SUSB and the hourly traffic to our events was



*Figure 12: Volunteer Lisa Cooke supervising the construction of a planisphere.*



*Figure 13: Volunteer Michael Cooke demonstrating the relative sizes of objects in the solar system.*

twice as high as it was this year. Despite the lower visitation rate, lead volunteers Ed Ching (planispheres), Achim Weidemann (telescope optics) and Michael Cooke (solar system) all felt that the more relaxed pace allowed for greater meaningful dialogue between the volunteers and attendees than in last year's frenetic environment.

I want to thank our SLAC contact, Rachel Isip for providing SMCAS with the opportunity to engage the SLAC community in our activities. I also want to thank our volunteers: Karen Boyer, Tina Cartaro, Darel Chapman, Ed Ching, Michael, Lisa and Isy Cooke, Rachel Freed, Alan Galitz, Vikas Kapur, Galina Sokolova, Achim Weideman, Wolf Witt and Dan Wright for their efforts and Ed Pieret for supplying much of the outreach material. Hopefully, we inspired those attending our activities to enthusiastically explore the cosmos around them.

## **NASA Night Sky Notes:**



*The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit [nightsky.jpl.nasa.org](https://nightsky.jpl.nasa.org) to find local clubs, events, and more!*

### ***The Orion Nebula: Window into a Stellar Nursery***

**By David Prosper**

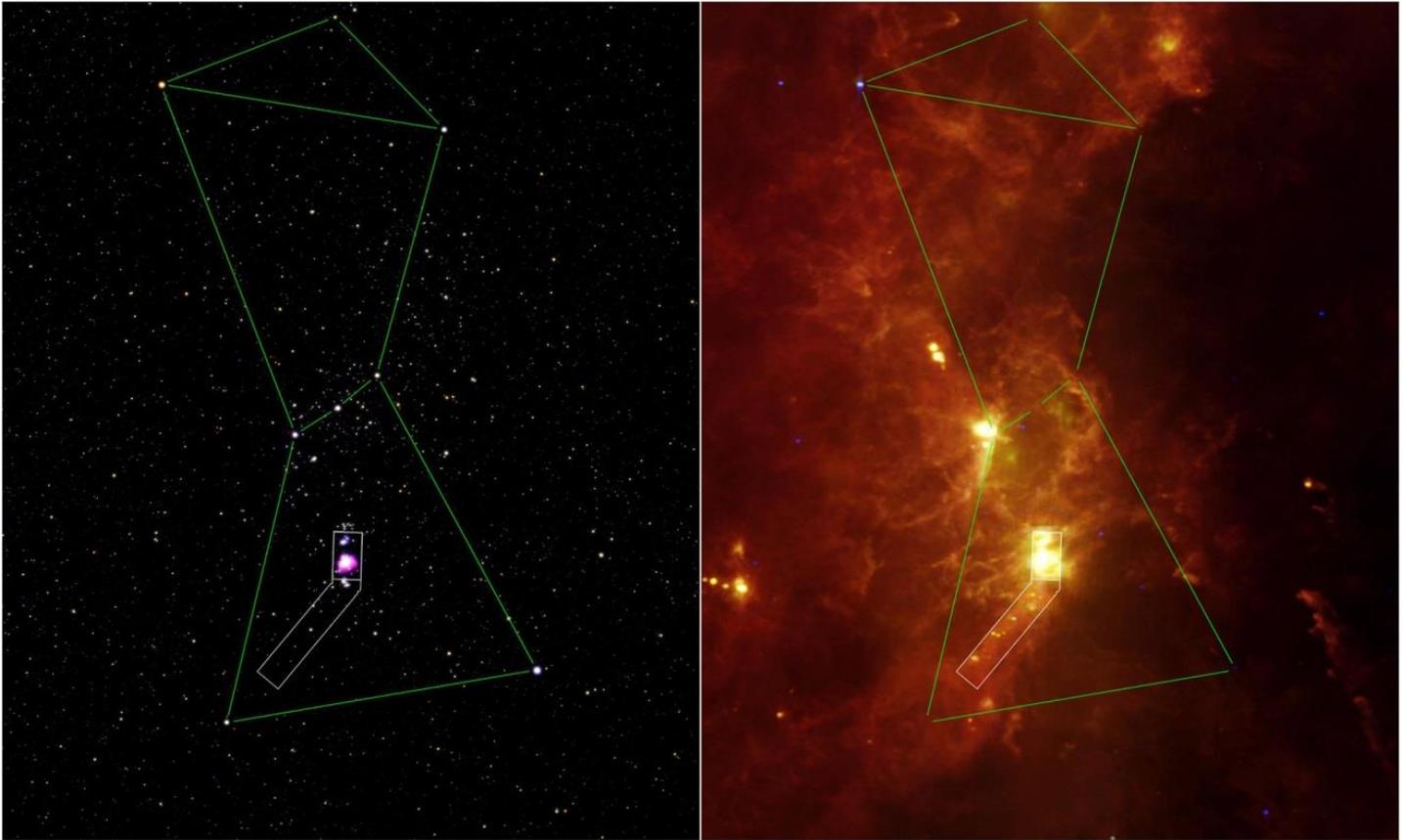
Winter begins in December for observers in the Northern Hemisphere, bringing cold nights and the return of one of the most famous constellations to our early evening skies: Orion the Hunter!

Orion is a striking pattern of stars and is one of the few constellations whose pattern is repeated almost unchanged in the star stories of cultures around the world. Below the three bright stars of Orion's Belt lies his sword, where you can find the famous Orion Nebula, also known as M42. The nebula is visible to our unaided eyes in even moderately light-polluted skies as a fuzzy "star" in the middle of Orion's Sword. M42 is about 20 light years across, which helps with its visibility since it's roughly 1,344 light years away! Baby stars, including the famous "Trapezium" cluster, are found inside the nebula's whirling gas clouds. These gas clouds also hide "protostars" from view: objects in the process of becoming stars, but that have not yet achieved fusion at their core.

The Orion Nebula is a small window into a vastly larger area of star formation centered around the constellation of Orion itself. NASA's Great Observatories, space telescopes like Hubble, Spitzer, Compton, and Chandra, studied this area in wavelengths we can't see with our earth-bound eyes, revealing the entire constellation alight with star birth, not just the comparatively tiny area of the nebula. Why then can we only see the nebula? M42 contains hot young stars whose stellar winds blew away their cocoons of gas after their "birth," the moment when they begin to fuse hydrogen into helium. Those gas clouds, which block visible light, were cleared away just enough to give us a peek inside at these young stars. The rest of the complex remains hidden to human eyes, but not to advanced space-based telescopes.

We put telescopes in orbit to get above the interference of our atmosphere, which absorbs many wavelengths of light. Infrared space telescopes, such as Spitzer and the upcoming James Webb Space Telescope, detect longer wavelengths of light that allow them to see through the dust clouds in Orion, revealing hidden stars and cloud structures. It's similar to the infrared goggles firefighters wear to see through smoke from burning buildings and wildfires.

Learn more about how astronomers combine observations made at different wavelengths with the Night Sky Network activity, ‘The Universe in a Different Light,’ downloadable from [bit.ly/different-light-nsn](http://bit.ly/different-light-nsn). You can find more stunning science and images from NASA’s Great Observatories at [nasa.gov](http://nasa.gov).



*Figure 14: This image from NASA’s Spitzer missions shows Orion in a different light – quite literally! Note the small outline of the Orion Nebula region in the visible light image on the left, versus the massive amount of activity shown in the infrared image of the same region on the right. Image Credit: NASA/JPL-Caltech/IRAS /H. McCallon. From [bit.ly/SpitzerOrion](http://bit.ly/SpitzerOrion).*

## Crestview Star Party

By Ed Pieret

Star parties are not what you normally think of when you hear the word party. There is no loud music, adult beverages, fattening food or raucous behavior. They are quiet events, held in the dark, to view and appreciate the wonders of the night sky.

SMCAS hosts a public star party at Crestview Park in San Carlos twice a month when the Moon is not present. At these events, members set up telescopes and share views and knowledge of the night sky. All ages are welcome. If you have kids interested in space or science, bring them here for a real time look at planets, nebula, star clusters, and galaxies.

If you own a telescope, bring it to the star party. If you need assistance setting up or finding targets in the sky, there will be experienced astronomers there to help you.

Astronomers gather and setup around sunset and observing starts about one hour after sunset. Arrive at sunset if you want to learn about telescopes and equipment. If you are thinking of buying a telescope, this is a time to learn about design, manufactures and features to look for.

In the event of inclement weather (rain, clouds, fog, or high winds) the star party will not be attended. Because each astronomer makes his or her own decision about attending and bringing a telescope, there is no official cancellation notice.

Email notices are sent out the day of the Crestview star party detailing sunset times and weather forecasts. If you would like to receive these and other announcements of local astronomy events, subscribe to: [SMCASnews@groups.io](mailto:SMCASnews@groups.io)



Figure 15: Array of telescopes set up for public stargazing at Crestview Park.

For more information go to <http://www.smcasastro.com/crestview-park.html>.

## ***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.

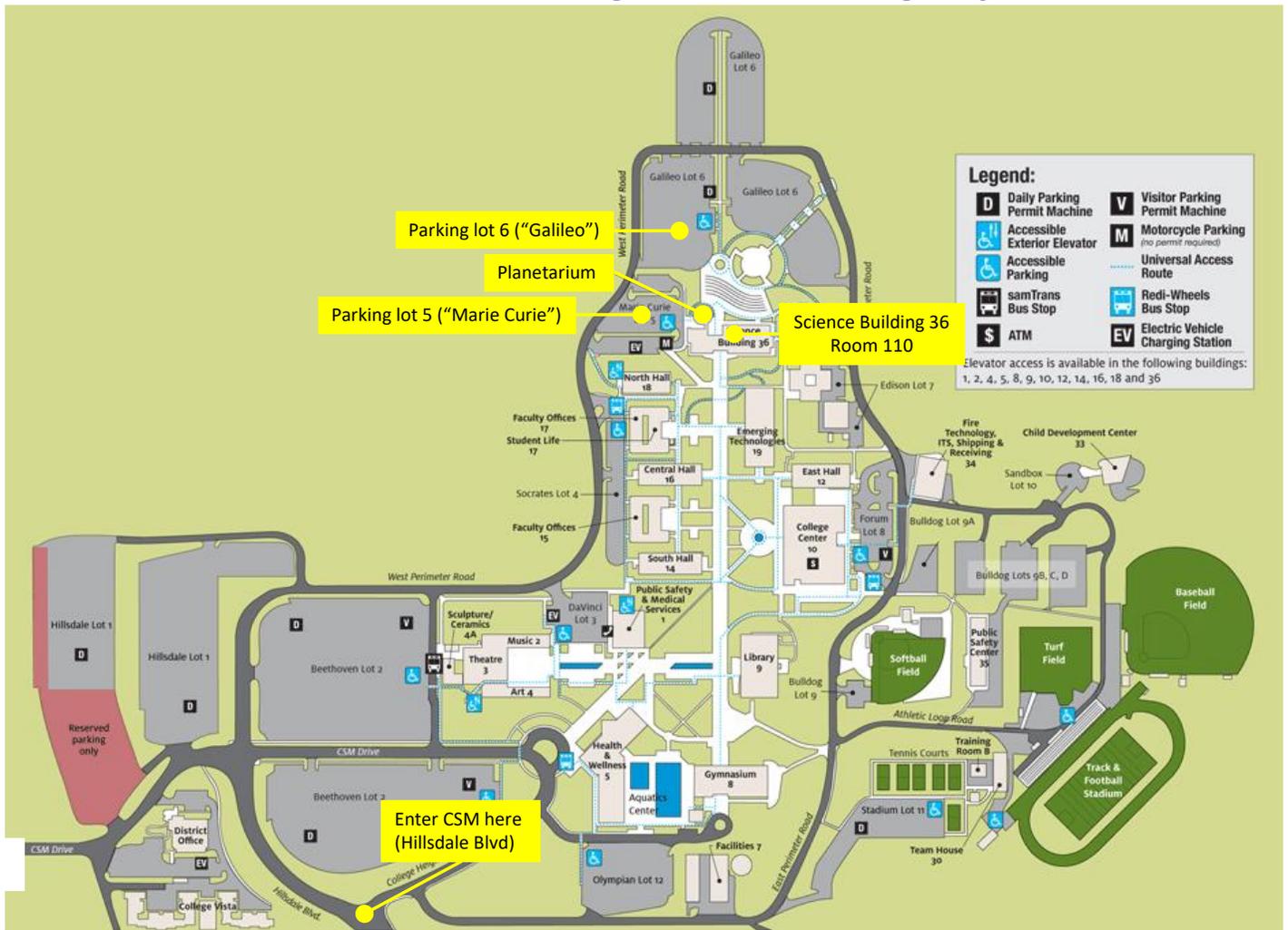
**Note:** If bringing a telescope and arriving after dark, please enter the Park with your headlamps and white interior lights off. If you aren't bringing a telescope, whether before or after dark, please park along Crestview Drive, and walk in.

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.

**Crestview Star Party schedule is here:**

<http://www.smcasastro.com/crestview-park.html>

# 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 of Hillsdale Blvd. Continue straight onto West Perimeter Road and follow it until you reach Lot 5, "Marie Curie", or Lot 6, "Galileo." Science (ISC) Bldg. (36) and the Planetarium lie straight ahead. Enter Bldg. 36 either through the door facing the lot, or walk around the dome to the courtyard entrance. We meet in ISC room 110 for pizza and soft drinks one hour prior to the talk in the Planetarium (pictured below).





# San Mateo County Astronomical Society

## Membership Application

rev 04062019

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

### ***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.
- **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 04062019

[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: \_\_\_\_\_