

★ ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

Vol. 64, No. 2 – February 2016

GENERAL MEETING

THE PRESIDIO . OBSERVATION POST . BUILDING 211

211 Lincoln Boulevard, San Francisco

7:00 pm Doors Open . 7:30 pm Announcements . 8:00 pm Speaker

February 16, 2016

BRIAN H. DAY

**NASA SOLAR SYSTEM EXPLORATION RESEARCH VIRTUAL
INSTITUTE LEAD FOR CITIZEN SCIENCE, PLANETARY MAPPING,
AND OUTREACH FILMS**

A HARD RAIN'S A-GONNA FALL



Throughout the entire history of life on Earth, we have been at the mercy of the deadly impacts by rocks from space. Just ask the dinosaurs! On multiple occasions, devastating impacts from Near Earth Objects (NEOs) have probably wiped out life on Earth, requiring life here to start over again. However, these events are not relegated to Earth's distant past. Each year, Earth experiences multiple near misses by asteroids and, as in the case of the Chelyabinsk event of 2013, sometimes takes a direct hit. But now,

for the first time in the entire history of life on Earth, we have the capability of doing something about it. In this talk, we will examine the threats posed to us by NEOs, explore strategies and technologies to mitigate these threats, and look at ways in which the amateur astronomy community can help save the world.

Brian Day works at NASA's Solar System Exploration Research Virtual Institute where he serves in lead positions for lunar and planetary mapping and modeling, citizen science, and outreach. He is a member of the site selection and analysis teams for the Resource Prospector and Lunar Mission One missions to the Moon, and is supporting analysis of potential human landing sites on Mars. Brian was the Education and Public Outreach Lead for NASA's LCROSS and LADEE lunar missions. He has participated in a number of Mars analog field studies in some of Earth's harshest environments, and in 2007, flew on NASA's Aurigid MAC mission to record fragments of comet Kiess entering Earth's upper atmosphere.

SFAA PRESIDENT'S NOTES FOR FEBRUARY 2016

2015 was an eventful year for the SFAA when we moved our meeting/lecture venue to Building 211/Observation Post in the Presidio. We are all in awe of this spectacular setting and room capacity to handle well over 100 attendees, which we have done at almost every meeting. We also instituted Observing Basics where experienced members bring their telescopes in to Building 211 prior to our lecture for display and to answer questions from new members or those from the general public. Look for our first Observing Basics in 2016 at our 15 March meeting/lecture.

We had a very successful Awards Dinner at the Mariposa Hunter's Point Yacht Club on 22 January. Everyone attending (including the Members of the Yacht Club) agreed that this was a great venue and we will probably come back. Hopefully the weather will cooperate next time and we will have a telescope or two on the deck for some observing, in between tacos.

The 16 February lecture is on a topic we should all sit up and pay attention to – Near Earth Objects (NEO's), sizable rocks travelling at high speeds that come all too close to Earth's orbit. Brian Day from NASA will give the latest on our search for these objects and how amateur astronomers might help in this effort.

The SFAA was invited by the Marin County Free Library to participate in their One Book One Marin program February to April 2016 as the book being discussed is "The Martian" by Bay Area author Andy Weir. SFAA volunteers have already set up telescopes for the citizens of Bolinas on 4 February and the weather did cooperate. At its peak, around 30 + enthusiastic and engaged Bolinas residents of all ages attended the event and observed M 42, M 31, the Double Cluster, had constellations identified for their future appreciation and had numerous questions answered.



Above former President Ken Frank (center) aims his laser pointer to identify a constellation to Bolinas residents, while a telescope is pointed at M 42.

More events will be happening at South Novato Library, Fairfax, Point Reyes Station and Marin City. The culminating event on 13 April will be at Dominican University where Michael Krasny of KQED will interview Andy Weir. Admission is free.

As always, the Officers and Board of the SFAA are interested in member suggestions on new ideas for events or improvements to what we are currently presenting. Please feel free to contact us at our monthly meeting/lecture or send a message using the Contact function on our website.

Michael Patrick

President

San Francisco Amateur Astronomers



SFAA 2016 LECTURE SERIES UPCOMING LECTURES

March 15 DR. AMY FURNISS THE VIOLENT UNIVERSE OBSERVED WITH THE FERMI TELESCOPE

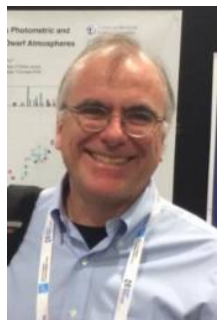


The Fermi Gamma-ray Space Telescope was launched into space in June 2008. The main instrument is the Large Area Telescope (LAT). Dr. Amy Furniss will present the Fermi-LAT instrument and highlight its most interesting results after seven years of operation. Gamma-ray observations open a new window into the universe, allowing us the study of exotic and violent processes. These photons are also an important tool in the search for the dark matter that pervades the universe. One expected signal is gamma rays from annihilations of massive dark matter particles, and the LAT has made by far the most sensitive searches for this process. The high-energy sky seen by the Fermi-LAT is quite

dynamic, including explosions of massive stars and their remnants and supermassive black holes in the centers of distant galaxies. The Fermi-LAT also enabled the identification of many cosmic particle accelerators, including supernova remnants and active galactic nuclei, which are far more powerful than the largest particle accelerator on Earth, the Large Hadron Collider in Europe.

Dr. Amy Furniss moved into a post-doctoral position at Stanford University for 2 years after completion of her PhD in Physics at UC Santa Cruz in 2013, She is now an Assistant Professor at Cal State University East Bay in Hayward California and continues to collaborate closely with connections at both UC Santa Cruz and Stanford.

April 19 DR. MARK MARLEY THE NEW ERA OF EXOPLANET DISCOVERY



Although science fiction has long dreamed of their existence, it has only been 20 years since the announcement of the first confirmed extrasolar planets. We now know of thousands of worlds beyond our own solar system. Almost all of these planets were discovered by indirect means, mostly by searches for the subtle effects of these distant planets on their own suns. While astronomers have developed astounding methods for teasing out details about many of these planets, the vast majority will forever remain as little more than curves and dips on data plots. However as we enter the third decade of exoplanet science a new method of discovery is coming to the forefront: direct imaging. This method aims to block the light of stars so that the planets that orbit them can be directly detected. Directly imaged planets are not only somehow more satisfying, they also offer many more opportunities for in depth study since their light is

naturally separated from that of their star. In my talk I will explain how direct imaging is already helping us to understand the origin and evolution of giant planets around young stars and I will discuss the promise this method holds in the search for life on Earth-like planets in the future.

Dr. Mark Marley is a Research Scientist at NASA's Ames Research Center in Mountain View. His research background includes studies on both solar system and extrasolar giant planets. He has served on multiple NASA teams helping to define the future of extrasolar planet discovery and characterization and is a member of the Gemini Planet Imager Exoplanet Survey

team, which recently announced the discovery of its first directly imaged planet. Dr. Marley has been awarded the NASA Medal for Exceptional Scientific Achievement and has published 150 scientific papers. As a Consulting Professor he teaches courses on solar system and extrasolar planets at Stanford University.

May 17 DR. MARK SHOWALTER

Senior Research Scientist, SETI Institute

PLUTO ON THE HORIZON: OUR FIRST ENCOUNTER WITH THE DOUBLE PLANET



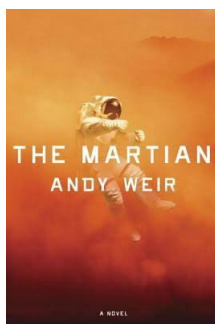
The more we learn about Pluto, the more interesting it becomes. In the last decade, four tiny moons have been discovered orbiting the central "binary planet," which consists of Pluto and its large moon Charon. Pluto itself has a thin atmosphere and shows signs of seasonal changes. Tantalizing evidence suggests that Charon may have volcanoes. However, even in our most powerful telescopes, Pluto and its moons are just dots in the sky. All of that changed on July 14, 2015, when NASA's New Horizons spacecraft flew past Pluto and provided our first close-up look at these distant worlds. In this lecture, Dr. Mark Showalter, a co-investigator on the New Horizons mission, will describe how he discovered two of the moons of Pluto and will discuss the results from the many first time images of Pluto from the New Horizons Mission.

His early work with Voyager data led to the discoveries of Jupiter's faint, outer "gossamer" rings and Saturn's tiny ring-moon, Pan. Starting in 2003, his observations with the Hubble Space Telescope led to the discoveries of "Mab" and "Cupid," small moons of Uranus now named after characters from Shakespeare's plays. In 2011, he began a Hubble observing program focused on Pluto, which led to the discoveries of two tiny moons. Their names, "Kerberos" and "Styx", were selected through an international naming campaign. Most recently, he discovered the 14th known moon of Neptune, whose permanent name has yet to be selected.

Dr. Mark Showalter is a Senior Research Astronomer at the SETI Institute who studies the dynamics of rings and small moons in the Solar System. He is the Principal Investigator of NASA's Planetary Data Systems, and works closely with the New Horizons Space Mission to Pluto. Dr. Showalter works on some of NASA's highest-profile missions to the outer planets, including Cassini, now orbiting Saturn, and New Horizons, which flew past Jupiter en route to its 2015 encounter with Pluto. Known for his persistence in planetary image analysis, Mark's work on the earlier Voyager mission led to his discovery of Jupiter's faint, outer "gossamer" rings and Saturn's tiny ring-moon, Pan.



**SFAA INVITED TO PARTICIPATE IN
ONE BOOK ONE MARIN
FEBRUARY 4 – APRIL 5, 2016**



Each year the Marin County Free Library (MCFL) chooses a book to be read and discussed during the same time period at all branches. "The goal of One Book One Marin is to build a stronger, enriched community through library utilization, community dialogue, and the exploration of literature and culture. A variety of community partners collaborate to bring the community interesting programming and events related to the book throughout a three-month period, February – April, each year. Anyone can participate. All events are free and open to the public."*

In early 2016 the book chosen to be discussed is "The Martian", by Bay Area author Andy Weir. Events will culminate at Dominican University in San Rafael with Michael Krasny of KQED interviewing Mr. Weir followed by a book signing.

A CALL FOR SFAA MEMBER TELESCOPES

The MCFL has invited the SFAA to be a focal point of events in One Book One Marin by setting up telescopes at five branch libraries for the public to observe selected objects and have them explained. In addition, the SFAA has requested publicity to suggest the attending public bring their own binoculars to the observing event so as to participate with their instrument as well as SFAA telescopes.

In 2013 the SFAA participated in a similar event when the One Book was "Packing for Mars" by Mary Roach. Public participation at each library location was around 50 enthusiastic people of all ages. Our efforts were well received by the public and the enthusiasm was mutual.

The dates and locations for our observing events are as follows:

Set up: 5:30; Talk 6:30; Viewing 6:45-8:00
Thursday, February 4 Bolinas Fire Station
Tuesday February 9 South Novato Library

Set up: 5:30; Talk 6:40; Viewing 7:00-8:15
Tuesday, March 8 Fairfax Library
Thursday, March 10 Point Reyes Library

Set up: 6:30; Talk 7:40; Viewing 8:00-8:45
Tuesday, April 5 Marin City Library

Participating SFAA members will have VIP seating at the interview of Andy Weir by Michael Krasny at Dominican University.

SFAA members interested in having fun sharing their telescope and knowledge of the universe with the public at these events should contact:

Michael Patrick
Email: mdpatric@pacbell.net

*Marin County Free Library website, One Book One Marin page



NASA – JPL What's Up - February 2016
WHAT'S UP FOR FEBRUARY? FIVE MORNING PLANETS, COMET CATALINA PASSES POLARIS AND ICY URANUS AND ICY VESTA MEET NEAR VALENTINE'S DAY.
Jane Houston Jones

Hello and welcome. I'm Jane Houston Jones from NASA's Jet Propulsion Laboratory in Pasadena, California.

February mornings feature Mercury, Venus, Saturn Mars and Jupiter lined up across the sky. The last time this five-planet dawn lineup happened was in 2005. The planets are easy to distinguish when you use the moon as your guide. Look for reddish Mars near the moon in the early morning of February first. Then, on the third, the moon passes near butterscotch-hued Saturn. On the sixth the moon, Mercury and Venus make a pretty triangle before sunrise. Then it's Jupiter's turn to pose with the moon on the 23rd. Through a telescope, Jupiter's pale yellow is transformed into bands of cream, ochre and tan. Finally, the moon passes Mars again on Leap Day, February 29th.

In case you miss the string of planetary pearls this month, you can see all five planets again in August's sunset sky, though Venus and Mercury will be very close to the horizon for Northern Hemisphere observers.

Last month comet Catalina's curved dust tail and straight ion tail were visible in binoculars and telescopes near two galaxies that are close to the handle of the Big Dipper. Early this month, the comet nears Polaris, the North Star. It should be visible all month long for Northern Hemisphere observers. There will be more opportunities to photograph comet Catalina paired with other objects this month. It passes the faint spiral galaxy IC 342 and a pretty planetary nebula named NGC 1501 between February 10th and the 29th. For binoculars viewers, the magnitude-6 comet pairs up with a pretty string of stars known as Kemble's Cascade on February 24th.

Finally, through binoculars you should be able to pick out Vesta and Uranus near one another this month. You can use the moon as a guide on the 12th and the corner stars of Pegasus all month long.

You can learn about NASA's missions to the planets and beyond at: www.nasa.gov.

That's all for this month. I'm Jane Houston Jones.



SAN FRANCISCO AMATEUR ASTRONOMERS EXPEDITION

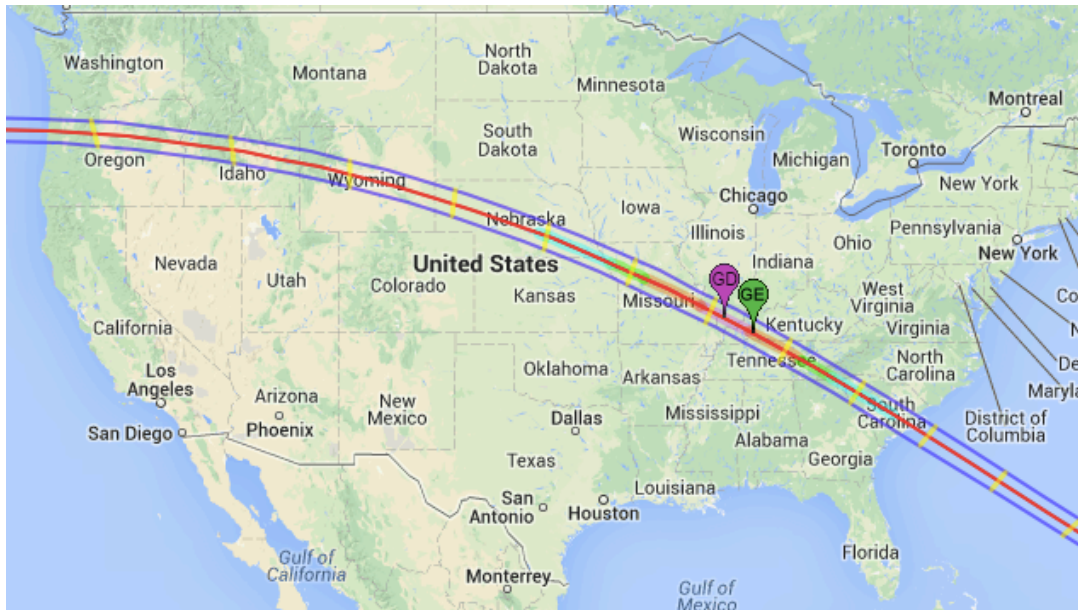
August 21, 2017

**TOTAL SOLAR ECLIPSE
Jackson Hole, Wyoming
(Teton Mountains)**

The San Francisco Amateur Astronomers is organizing an expedition to witness the August 21, 2017 Total Solar Eclipse. The eclipse will be visible across a broad swath of the USA, and club members will gather near Jackson Hole, Wyoming, to witness this spectacle high in the Teton Mountains. The trip is an opportunity for club members to gather in one place along the path of totality and journey together up the mountains for viewing of this spectacular astronomical phenomenon.

The club has arranged with a hotel in Teton Village, Wyoming, to enable advance bookings (2 years in advance!) with a special club rate of 10% discount. If you are a member of the SFAA and are interested in this, send an email to 2017eclipse@sfaa-astronomy.org and you'll be provided with additional details on the hotel and booking code. In the coming months the club will organize additional talks and events that will take place at the hotel on and before the date of totality. At this time, the most important thing is to book your hotel room so if you are at all considering this eclipse, get in touch and get your reservation in today. SFAA is not organizing air or ground transportation; that is left to each individual group or attendee.

If you have any other questions, send to 2017eclipse@sfaa-astronomy.org.



BAY AREA ASTRONOMY EVENTS

Kenneth Lum

As each month unfolds, check the following link for information regarding additional events

<http://tech.groups.yahoo.com/group/bayastro/?v=1&t=directory&ch=web&pub=groups&sec=dir&slk=94>

BAY AREA REGULARLY SCHEDULED EVENTS

**EVERY FRIDAY NIGHT
7:00 PM – 10:00 PM
excluding major holidays**

**The Telescope Makers'
Workshop**

**CHABOT SPACE AND
SCIENCE CENTER
10000 Skyline Boulevard
Oakland, CA 94619-2450**

THE TELESCOPE MAKERS' WORKSHOP is held every Friday night from 7pm - 10pm, excluding major holidays (e.g. Christmas Day and New Year's Day) that fall on Fridays. The Workshop is always closed on Memorial Day Weekend. Attendance every Friday night is not mandatory, and members work at their own pace. The Workshop meets at Chabot Space & Science Center, 10000 Skyline Blvd., Oakland.

Chabot's TMW is one of only a handful of regularly scheduled telescope making workshops in the U.S., and probably the world; it meets every Friday evening throughout the year, except Memorial Day weekend. It has been in operation since December of 1930, founded by Franklin B. Wright, and is currently run by Eastbay Astronomical Society member Rich Ozer, with help from other EAS members, Dave Barosso, Barry Leska, and others. The price of admission is FREE. All you have to do is show up, buy a mirror blank and a "tool" (typically around \$100 - \$200 depending on the size of the mirror) and start "pushin' glass!" We supply you with instruction, the various grits you'll need to first grind, and then polish and figure your mirror, and all the testing equipment needed. With a small bit of luck, you could wind up with a telescope that costs 1/3 or 1/4 the cost of a store-bought telescope, that is yet optically superior! It does take time - depending on how much time you put in on it, and other factors, it could take a few months or several months. But, it's a fun project, great for kids, and at the end you get a great telescope!

For more information call or email Richard Ozer at rozer@pacbell.net or phone (510) 406-1914.

<p>EVERY FRIDAY & SATURDAY EVENING, weather permitting 7:30 PM – 10:30 PM</p> <p>CHABOT SPACE AND SCIENCE CENTER 10000 Skyline Boulevard Oakland CA 94619-2450 (510) 336-7300</p>	<p>EXPLORE THE NIGHT SKIES AT THE CHABOT OBSERVATORIES For more information: http://www.chabotspace.org/</p> <p>Free Telescope Viewing Regular hours are every Friday & Saturday evening, weather permitting: 7:30pm - 10:30pm Come for spectacular night sky viewing the best kept secret in the Bay Area and see the magnificence of our telescopes in action!</p> <p>Daytime Telescope Viewing On Saturday and Sunday afternoons come view the sun, moon, or Venus through Chabot's telescopes. Free with General Admission. (weather permitting)</p> <p>12pm - 5pm: Observatories Open</p>
<p>Sunset – 5:11 PM (TWICE MONTHLY)</p> <p>Inclement weather (clouds, excessive wind and showers) will cause the event to be canceled without notice.</p> <p>SAN MATEO COUNTY ASTRONOMICAL SOCIETY STAR PARTY</p>	<p>STAR PARTIES AT CRESTVIEW PARK, SAN CARLOS</p> <p>Come out and bring the kids for a mind expanding look at the universe</p> <p>The City of San Carlos Parks and Recreation Department and the San Mateo County Astronomical Society have open Star Parties twice a month. These events are held in Crestview Park, San Carlos California. Note that inclement weather (clouds, excessive wind and showers) will cause the event to be canceled without notice.</p> <p>For more information call Bob Black, (650)592-2166, or send an email to SMCAS@live.com or call Ed Pieret at (650)862-9602.</p> <p>Reasons to Attend If you have kids interested in space or planets bring them here for a real life view of planets, nebula, star clusters and galaxies. If you are thinking of buying a telescope or want help using a telescope you own, come here to talk with experienced users. If you think you might have an interest in astronomy come and talk to experienced amateur astronomers.</p> <p>Cautions Dress warmly and wear a hat. Visitors should park on the street and walk into the park so your headlights don't affect the observer's dark adaptation. Only park in the parking lot if you are arriving before dark and plan to stay until the end of the event. You shouldn't need lights but if you feel you do, only bring a small flashlight with the lens covered using red cellophane or red balloon. Please respect the telescopes and ask permission from the owner if you wish to touch. Parents, please watch your children. The park is residential, and adjacent to homes and backyards, please keep noise to a minimum.</p> <p>Schedule Time Astronomers arrive to set up at around sunset. Observing starts at about one hour after sunset and continues for two to three hours.</p>

<p>EVERY CLEAR SATURDAY MORNING OBSERVATORY 10:00 AM – 12:00 PM</p> <p>FOOTHILL COMMUNITY COLLEGE 12345 Moody Road Los Altos Hills</p> <p>Cost: Free</p>	<p>Solar observing with a Hydrogen alpha solar telescope every clear Saturday morning. This allows spectacular views of solar prominences and unusual surface features on the Sun not otherwise visible with regular white light telescopes. Admission is free.</p> <p>Foothill Observatory is located on the campus of Foothill College in Los Altos Hills, CA. Take Highway 280 to the El Monte Rd. exit. The observatory is next to parking lot 4. Parking at the college requires visitor parking permits that are available from the machines in the parking lots for \$ 3.00.</p>
<p>EVERY CLEAR FRIDAY EVENING 9:00 PM – 11:00 PM</p> <p>FOOTHILL COMMUNITY COLLEGE OBSERVATORY 12345 Moody Road Los Altos Hills</p> <p>Cost: Free</p>	<p>Foothill Observatory is open for public viewing every clear Friday evening from 9:00 p.m. until 11:00 p.m. Visitors can view the wonders of the universe through the observatory's computer-controlled 16- inch Schmidt-Cassegrain telescope. Views of objects in our solar system may include craters and mountains on the moon, the moons and cloud-bands of Jupiter, the rings of Saturn, etc. Deep space objects including star clusters, nebulae, and distant galaxies also provide dramatic demonstrations of the vastness of the cosmos. The choice of targets for Any evening's viewing depends on the season and what objects are currently in the sky.</p> <p>The public viewing programs at Foothill are free of charge and are open to guests of all ages. Please note that the observatory is closed when the weather is cloudy. Also note that visitor parking permits are available from the machines in the parking lots for \$3.00.</p> <p>Come to Foothill Observatory and join us in the exploration of our Universe!</p> <p>Foothill Observatory is located on the campus of Foothill College in Los Altos Hills, CA. Take Highway 280 to the El Monte Rd exit. The observatory is next to parking lot 4. Parking at the college requires visitor parking permits that are available from the machines in the parking lots for \$3.00.</p>

BAY AREA EVENTS – FEBRUARY 2016

<p>MONDAY, 1/4 12:00 AM – 3:00 AM</p> <p>CHABOT SPACE AND SCIENCE CENTER 10000 Skyline Boulevard Oakland CA 94619-2450 (510) 336-7300</p> <p>Cost: \$5</p>	<p>QUADRANTIDS METEOR SHOWER</p> <p>Hang out on the hill with us as we watch the Quadrantids Meteor Shower make it's annual trip through our atmosphere and light up the night sky. Our scientists will be ready to help you catch the brightest meteors in this prolific shower!</p> <p>*Visibility may be obscured by the waning gibbous (nearly full) moon</p> <p>Website: http://www.chabotspace.org/events.htm</p>
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<p>THURSDAY, 1/07 11:00 AM - 12:00 PM</p> <p>KAVLI INSTITUTE ASTROPHYSICS COLLOQUIUM Location TBA Stanford, CA 94305</p> <p>Cost: Free</p>	<p>BRIAN METZGER, COLUMBIA UNIVERSITY SIGNATURES OF NEUTRON STAR MERGERS IN THE ERA OF ADVANCED LIGO</p> <p>Coalescing stellar mass compact objects (binary neutron stars and black holes) are promising sources for the direct detection of gravitational waves by Advanced LIGO in the next few years, if not this fall. Maximizing the scientific return from such a discovery will require identifying a coincident electromagnetic counterpart. One possible counterpart is a short gamma ray burst, powered by the accretion of a centrifugally supported torus onto the central black hole. Neutron star mergers are also accompanied by a thermal optical/IR transient, powered by the radioactive decay of neutron-rich elements synthesized in the merger ejecta (a 'kilonova'). In addition to providing a beacon to the gravitational wave chirp, kilonovae provide a direct probe of an astrophysical site for rapid neutron capture (r-process) nucleosynthesis. I will describe recent work showing how free neutrons in the outermost layers of the ejecta could power a bright 'precursor' to the main kilonova emission, greatly enhancing the prospects for its detection.</p> <p>Website:http://kipac.stanford.edu/collab/seminars/ac/astrophysics-colloquium-winter-2016/20160107</p>
<p>FRIDAY, 01/08/16 06:00 PM - 10:00 PM</p> <p>EVERGREEN VALLEY COLLEGE VISUAL PERFORMANCE ARTS (APA) THEATER 3095 Yerba Buena Rd San Jose, CA 95135</p> <p>Parking & campus map: Free parking after 6:00 PM in parking lot #6 for this event.</p>	<p>OUR FANTASTIC MOON</p> <p>The full moon is the second brightest object in the sky. This talk will be initiated with a historical overview of the role played by the moon in Indian, Mesopotamian, and Meso-american cultures. It will be proceed with a discussion of few curious facts about the geometry of its orbital motion and cyclic events. We complete with a survey of high resolution pictures and videos released by several lunar missions, especially the Lunar Reconnaissance Orbiter (LRO).</p> <p>Enjoy a free public stargazing after the talk at the Montgomery Hill Observatory of Evergreen Valley College from 7 pm to 10 pm.</p> <p>The facility has an 8-inch refractor telescope in a dome observatory, 14-inch SC telescope in a roll off roof observatory and several other telescopes set out for the public. View Andromeda Galaxy, Orion Nebula, Crab Nebula , Double cluster in Perseus, star cluster Hyades, Pleiades, "Owl" cluster, Beehive cluster, bright stars Rigel, Betelgeuse, Sirius, Aldebaran and many more objects</p>
<p>FRIDAY, 01/08 7:30 PM</p> <p>PENINSULA ASTRONOMICAL SOCIETY FOOTHILL COLLEGE Room 5015 Los Altos Hills, CA 94022</p>	<p>THE NGC/IC PROJECT</p> <p>Steve Gottlieb has been an active observer and catalogue junkie for over 25 years and member of SFAA since 1981. He's written a number of deep-sky observing articles for Sky & Telescope, Astronomy, Deep Sky Magazine as well as the SFAA bulletin. Some of his observing challenges can be found at Adventures in Deep Space at: http://www.astronomy-mall.com/Adventures.In.Deep.Space/. His 600 favorite deep-sky objects are featured in the Orion "Deep Map 600" and the results of his catalogue sleuthing can be found in a number of popular digital setting circles which use his corrected databases.</p>

<p>SATURDAY, 1/09 08:00 PM - 10:00 PM</p> <p>CHABOT SPACE AND SCIENCE CENTER 10000 Skyline Blvd Oakland, CA 94619</p> <p>Cost \$15</p>	<p>DR. KEN WHARTON THE PHYSICS OF TIME TRAVEL (THIS ONE IS REALLY WORTH HEARING ABOUT!)</p> <p>Is time travel science fiction or a plausible reality? Written about for centuries and theorized by the most celebrated scientists, the quantum mechanics of time travel are still a hot topic in modern physics. Using popular movies as a framework, Professor Wharton will outline several distinct categories of consistent time travel stories, and discuss possible connections with actual physics.</p> <p>Website: https://14884.blackbaudhosting.com/14884/tickets?tab=2&txobjid=7d7dd969-3926-4037-a895-4b7f781f503d</p>
<p align="center">Check the following link for information regarding additional events http://tech.groups.yahoo.com/group/bayastro/?v=1&t=directory&ch=web&pub=groups&sec=dir&slk=94</p>	
<p>THURSDAY, 2/18 4:00 PM</p> <p>LOCKHEED MARTIN COLLOQUIA 3251 Hanover St Building 202 Auditorium Palo Alto, CA 94304</p>	<p>KAVLI INSTITUTE ASTROPHYSICS COLLOQUIUM FRANS PRETORIUS, PRINCETON</p> <p>MORE ON GRAVITY WAVES! COMPACT OBJECT MERGERS</p> <p>Binary compact object mergers are among the primary gravitational wave sources expected to be observed by the next generation of ground-based gravitational wave detectors. Mergers where one or both compact objects are neutron stars will further produce electromagnetic emission, and coincident observation of this together with gravitational wave emission could teach us much about the progenitor systems, test general relativity in the dynamical strong field regime, and help elucidate the nature of matter at nuclear density. I will begin by giving an overview of the state of the field. I will then discuss more recent work with collaborators focusing on mergers occurring while the orbit still has sizeable eccentricity, and where neutron stars are allowed to have rapid spins. Large eccentricity is expected for mergers that occur following dynamical capture or 3-body interactions in dense cluster environments, and observations imply millisecond pulsars are common in globular clusters. Though these events may be rarer than the traditional quasi-circular inspiral, they could exhibit strikingly different behavior, including zoom-whirl orbital dynamics, and large amounts of unbound material for cases where the neutron star is tidally disrupted. Neutron star spin also seems to provide an ingredient that can cause a hypermassive remnant formed in a binary neutron star merger to be susceptible to the so-called one-arm spiral instability.</p>
<p>THURSDAY, 2/18 4:00 PM</p> <p>Lockheed Martin Colloquia 3251 Hanover St Building 202 Auditorium Palo Alto CA 94304</p>	<p>NEWEST INFORMATION OF THE CONTINUING DOWNLOAD OF PLUTO DATA FROM NEW HORIZON!</p> <p>DR. MARK SHOWALTER, SETI THE NEW HORIZONS FLYBY OF PLUTO: AN INSIDER'S VIEW</p> <p>NASA's Mew Horizons spacecraft passed through the Pluto system on July 14, 2015, sending back our first closeup views of that distant, mysterious world and its retinue of moons. The spacecraft executed its observing sequence flawlessly, and the images are still being slowly downlinked back to Earth. The images have already revealed a remarkable landscape containing broad plains, including mountain ranges several kilometers high, and evidence for volcanoes. Mark Showalter, a member of the New Horizons science team, will recount the inside story of the historic flyby and discuss the latest scientific results.</p>

	<p>Dr. Mark Showalter, a senior research scientist at the SETI Institute in Mountain View, studies the dynamics of rings and small moons in the Solar System. His investigations using Voyager data and the Hubble Space Telescope have led to the discoveries of six planetary moons: Pan at Saturn, Mab and Cupid at Uranus, Kerberos and Styx at Pluto, and an as yet unnamed moon of Neptune. He is a co-investigator on NASA's New Horizons mission and has been deeply involved in the search for small moons and faint rings.</p>
<p>THURSDAY, 2/18 6:00 – 8:00 PM</p> <p>SCARLET CITY ESPRESSO BAR 3960 Adeline Street Emeryville, CA 94608</p> <p>Cost: Free</p>	<p>WATCHING THE UNIVERSE GROW UP: SNAPSHOTS THROUGH TIME USING RADIO WAVES</p> <p>How did the first generation of stars and galaxies form in our Universe? Astronomers don't know, but they have ideas-which are hard to confirm.</p> <p>Join Adrian Liu for a "sneak preview" of what will come in the next few years, as a new technique known as "21cm cosmology" revolutionizes our understanding of how our present Universe -- with its majestic astronomical patterns -- came to be.</p>
<p>THURSDAY, 2/18 8:00 PM</p> <p>EXPLORATORIUM Pier 15 (Embarcadero at Green Street) San Francisco, CA 94111</p> <p>Cost: : \$15 General \$10 Members</p>	<p>EVERYTHING MATTERS: SODIUM</p> <p>Come be in your elements with Exploratorium host and scientific raconteur Ron Hipshman. Follow tales of intrigue and invention, join in dynamic demonstrations, and uncover fascinating connections between individual elements and our collective human experience.</p> <p>Part of "After Dark" (6:00 PM - 10:00 PM)</p> <p>Website: http://www.exploratorium.edu/visit/calendar/after-dark/02-18-2016</p>
<p>FRIDAY, 2/19 7:30 PM</p> <p>EXPLORATORIUM Pier 15 (Embarcadero at Green Street) San Francisco, CA 94111</p> <p>Cost: Free</p>	<p>BRIAN MICHAEL BUCHER, LAWRENCE LIVERMORE LABS SEARCHING FOR THE FIRST STARS THROUGH NUCLEAR REACTIONS</p> <p>Over the years, the interplay between nuclear physics, computational astrophysics, and observational astronomy has been critical to our understanding of the cosmos. Nuclear data and astrophysical models continue to provide key input to help explain and guide astronomical observations. Once recent example involves the search for the first generation of stars in the galaxy, which is predicted to have a rather unique chemical abundance signature compared to later generations of stars whose composition has been enriched with heavy metals. The predicted chemical abundance patterns depend sensitively on available nuclear data among other factors. One important nuclear reaction is the fusion of two carbon nuclei into a magnesium nucleus and a free neutron. In the past, many astrophysical models simply ignored this reaction because the available rate estimates were so uncertain. Now, however, a precise measurement of this reaction at astrophysical conditions has finally been provided using a laboratory accelerator. With the new measurement, it is found that this reaction is critical to the production of elements with odd atomic numbers (e.g. sodium, Z=11) in the first stars while also important to heavy-element synthesis in later stellar generations.</p>

<p>FRIDAY, 2/19 7:30 PM (PLEASE NOTE THE DATE CHANGE)</p> <p>PENINSULA ASTRONOMICAL SOCIETY Room 5015 Foothill College Los Altos Hills, CA 94022</p> <p>Cost: Free</p>	<p>ORKAN M. UMURHAN "THE EVOLUTION OF PLANETARY LANDSCAPES FROM CALLISTO TO HELENE"</p> <p>Landform evolution modelling has become an important tool in interpreting the landscapes of the icy satellites of the solar system. In this talk, I will discuss the methods that are applied to this purpose and describe its application to several interesting icy satellite bodies, including Titan, Triton, Callisto and Helene. The talk will conclude with a preview of landform evolution modelling results applied to Pluto.</p> <p>Dr. Umurhan's research focuses on evolutionary processes both on planetary surfaces and in protoplanetary disks. He has published on a number of topics including astrophysical flows and turbulence, fundamentals of shear flow instabilities, geomorphology and landform evolution and its modelling. Dr. Umurhan joined the New Horizons Geology and Geophysics Investigation Team in June of 2013. His main role on this mission has been in providing mathematical modelling framework for the various geophysical scenarios of interest and appropriate to the Pluto system. Dr. Umurhan regularly writes blogposts for NASA about New Horizons and he is also a co-author on a graduate level textbook on fluid dynamics for physicists due to come out this spring.</p>
<p>TUESDAY, 2/23 12:00 NOON</p> <p>SETI INSTITUTE COLLOQUIUM SERIES GALILEO AUDITORIUM, MICROSOFT SVC BUILDING ONE 1065 La Avenida Mountain View, CA 94043</p> <p>Cost: Free</p>	<p>ANDREW SIEMION, UC BERKELEY THE BREAKTHROUGH INITIATIVE - LISTEN AND MEGASTRUCTURES AT KIC 8463</p> <p>Dr. Andrew Siemion, Director of the Berkeley SETI Research Center (BSRC) at the University of California, Berkeley, will present an overview of the Breakthrough Listen Initiative, 100-million-dollar, 10-year search for extraterrestrial intelligence. Dr. Siemion will also discuss other SETI efforts ongoing at the BSRC, including the successful citizen science project SETI@Home, as well as a concerted effort to undertake panchromatic observations of the mysterious Kepler star KIC 8462852.</p>
<p>TUESDAY, 2/23 4:30 PM</p> <p>HEWLETT TEACHING CENTER STANFORD UNIVERSITY Room 201 Stanford, CA 94305</p> <p>Cost: Free</p>	<p>THE GENESIS OF GENERAL RELATIVITY AND ITS FORMATIVE YEARS SPEAKER: HANOCH GUTRUFEND, HEBREW UNIV. OF JERUSALEM</p>
<p>THURS., FEB. 25 4PM</p> <p>LOCKHEED MARTIN COLLOQUIA 3251 HANOVER ST BUILDING 202 AUDITORIUM Palo Alto, CA 94304</p>	<p>DR. DEBBIE G. SENESKY AERONAUTICS AND ASTRONAUTICS DEPARTMENT, STANFORD UNIVERSITY: SENSING IN EXTREME ENVIRONMENTS</p>

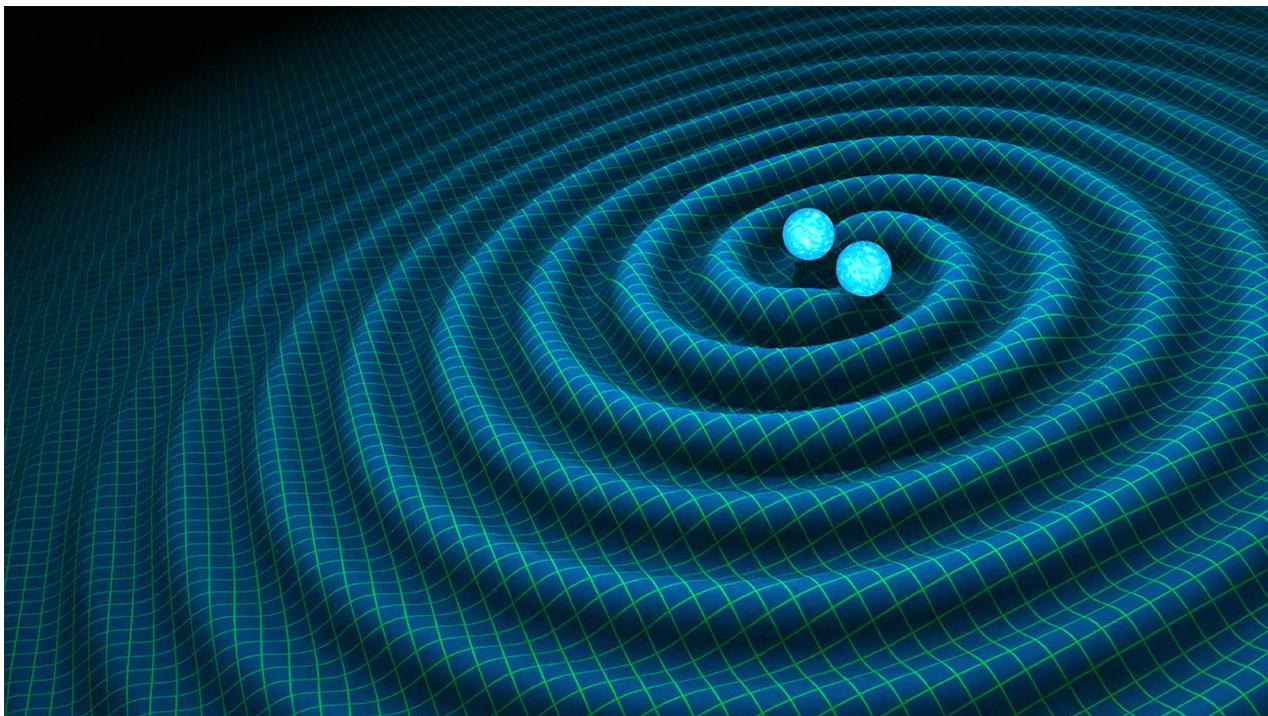
<p>Thursday, 02/25 7:00 PM</p> <p>USGS Evening Public Lecture Series 345 Middlefield Road Bldg 3, 2nd Floor Rambo Auditorium Menlo Park, CA 94025</p> <p>Cost: Free</p>	<p>ROSS STEIN, USGS AND STANFORD THE GOLD RUSH AND THE 1906 EARTHQUAKE: HOW THEY COMBINED TO CREATE THE BREAKTHROUGH DISCOVERY OF MODERN SEISMIC SCIENCE</p> <ul style="list-style-type: none"> • Accidents of Gold Rush merchant marine navigation transformed a seismic disaster into a seminal discovery and led to San Francisco's extreme liquefaction vulnerability today. • Just about everything that we love about the Bay area is brought to us by the faults. We enjoy their daily fruits and so must live with their occasional spoils. • No one knows when the next damaging quake will strike; we must frame the 'payback period' for seismic expenditures in terms of chance.
<p>FRIDAY, FEBRUARY 26 7:00PM</p> <p>HOUGE PARK SAN JOSE, CA</p>	<p>SAN JOSE ASTRONOMICAL ASSOCIATION IN-TOWN STAR PARTY</p> <p>Come view the heavens through a telescope at the SJAA's In Town Star Party. Bring a scope to share the views, and if you do, feel free to come early to set up. Remember, this event is free, everyone is invited, no reservations required. Just show up!</p>

ARTICLE OF INTEREST

NASA JPL SCIENCE NEWS

FEBRUARY 11, 2016

GRAVITATIONAL WAVES DETECTED 100 YEARS AFTER EINSTEIN'S PREDICTION



An artist's impression of gravitational waves generated by binary neutron stars. Credits: R. Hurt/Caltech-JPL

Congratulations to the National Science Foundation, Caltech, MIT and the entire LIGO Team!

Background information and a replay of today's news conference announcing the detection are online at:
<http://www.caltech.edu/gwave>

LIGO opens new window on the universe with observation of gravitational waves from colliding black holes.

For the first time, scientists have observed ripples in the fabric of spacetime called gravitational waves, arriving at the earth from a cataclysmic event in the distant universe. This confirms a major prediction of Albert Einstein's 1915 general theory of relativity and opens an unprecedented new window onto the cosmos.

Gravitational waves carry information about their dramatic origins and about the nature of gravity that cannot otherwise be obtained. Physicists have concluded that the detected gravitational waves were produced during the final fraction of a second of the merger of two black holes to produce a single, more massive spinning black hole. This collision of two black holes had been predicted but never observed.

The gravitational waves were detected on September 14, 2015 at 5:51 a.m. Eastern Daylight Time (09:51 UTC) by both of the twin Laser Interferometer Gravitational-wave Observatory (LIGO) detectors, located in Livingston, Louisiana, and Hanford, Washington, USA. The LIGO Observatories are funded by the National Science Foundation (NSF), and were conceived, built, and are operated by Caltech and MIT. The discovery, accepted for publication in the journal *Physical Review Letters*, was made by the LIGO Scientific Collaboration (which includes the GEO Collaboration and the Australian Consortium for Interferometric Gravitational Astronomy) and the Virgo Collaboration using data from the two LIGO detectors.

Based on the observed signals, LIGO scientists estimate that the black holes for this event were about 29 and 36 times the mass of the sun, and the event took place 1.3 billion years ago. About 3 times the mass of the sun was converted into gravitational waves in a fraction of a second -- with a peak power output about 50 times that of the whole visible universe. By looking at the time of arrival of the signals -- the detector in Livingston recorded the event 7 milliseconds before the detector in Hanford -- scientists can say that the source was located in the Southern Hemisphere.

According to general relativity, a pair of black holes orbiting around each other lose energy through the emission of gravitational waves, causing them to gradually approach each other over billions of years, and then much more quickly in the final minutes. During the final fraction of a second, the two black holes collide into each other at nearly one-half the speed of light and form a single more massive black hole, converting a portion of the combined black holes' mass to energy, according to Einstein's formula $E=mc^2$. This energy is emitted as a final strong burst of gravitational waves. It is these gravitational waves that LIGO has observed.

LIGO was originally proposed as a means of detecting these gravitational waves in the 1980s by Rainer Weiss, professor of physics, emeritus, from MIT; Kip Thorne, Caltech's Richard P. Feynman Professor of Theoretical Physics, emeritus; and Ronald Drever, professor of physics, emeritus, also from Caltech.

"With this discovery, we humans are embarking on a marvelous new quest: the quest to explore the warped side of the universe -- objects and phenomena that are made from warped spacetime. Colliding black holes and gravitational waves are our first beautiful examples," says Thorne.

"The description of this observation is beautifully described in the Einstein theory of general relativity formulated 100 years ago and comprises the first test of the theory in strong gravitation. It would have been wonderful to watch Einstein's face had we been able to tell him," says Weiss.

"Caltech thrives on posing fundamental questions and inventing new instruments to answer them," says Caltech president Thomas Rosenbaum, the Sonja and William Davidow Presidential Chair and professor of physics. "LIGO

represents an exhilarating example of how this approach can transform our knowledge of the universe. We are proud to partner with NSF and MIT and our other scientific collaborators to lead this decades-long effort."

"Our observation of gravitational waves accomplishes an ambitious goal set out over five decades ago to directly detect this elusive phenomenon and better understand the universe, and, fittingly, fulfills Einstein's legacy on the 100th anniversary of his general theory of relativity," says Caltech's David H. Reitze, executive director of the LIGO Laboratory.

"This discovery is just the beginning," says Fiona Harrison, the Benjamin M. Rosen Professor of Physics and holder of the Kent and Joyce Kresa Leadership Chair of the Division of Physics, Mathematics and Astronomy. "Over the next years, LIGO will be putting general relativity to its most stringent tests ever, it will be discovering new sources of gravitational waves, and we will be using telescopes on the ground and in space to search for light emitted by these catastrophic events."

The existence of gravitational waves was first demonstrated in the 1970s and 80s by Joseph Taylor, Jr., and colleagues. Taylor and Russell Hulse discovered in 1974 a binary system composed of a pulsar in orbit around a neutron star. Taylor and Joel M. Weisberg in 1982 found that the orbit of the pulsar was slowly shrinking over time because of the release of energy in the form of gravitational waves. For discovering the pulsar and showing that it would make possible this particular gravitational wave measurement, Hulse and Taylor were awarded the Nobel Prize in Physics in 1993.

The new LIGO discovery is the first observation of gravitational waves themselves, made by measuring the tiny disturbances the waves make to space and time as they pass through the earth.

LIGO research is carried out by the LIGO Scientific Collaboration (LSC), a group of more than 1000 scientists from universities around the United States and in 14 other countries. More than 90 universities and research institutes in the LSC develop detector technology and analyze data; approximately 250 students are strong contributing members of the collaboration. The LSC detector network includes the LIGO interferometers and the GEO600 detector. The GEO team includes scientists at the Max Planck Institute for Gravitational Physics (Albert Einstein Institute, AEI), Leibniz Universität Hannover, along with partners at the University of Glasgow, Cardiff University, the University of Birmingham, other universities in the United Kingdom, and the University of the Balearic Islands in Spain.

"This detection is the beginning of a new era: The field of gravitational wave astronomy is now a reality," says Gabriela González, LSC spokesperson and professor of physics and astronomy at Louisiana State University.

The discovery was made possible by the enhanced capabilities of Advanced LIGO, a major upgrade that increases the sensitivity of the instruments compared to the first generation LIGO detectors, enabling a large increase in the volume of the universe probed -- and the discovery of gravitational waves during its first observation run. The US National Science Foundation leads in financial support for Advanced LIGO. Funding organizations in Germany (Max Planck Society), the U.K. (Science and Technology Facilities Council, STFC) and Australia (Australian Research Council) also have made significant commitments to the project. Several of the key technologies that made Advanced LIGO so much more sensitive have been developed and tested by the German UK GEO collaboration. Significant computer resources have been contributed by the AEI Hannover Atlas Cluster, the LIGO Laboratory, Syracuse University, and the University of Wisconsin-Milwaukee. Several universities designed, built, and tested key components for Advanced LIGO: The Australian National University, the University of Adelaide, the University of Florida, Stanford University, Columbia University of New York, and Louisiana State University.

"In 1992, when LIGO's initial funding was approved, it represented the biggest investment the NSF had ever made," says France Córdoba, NSF director. "It was a big risk. But the National Science Foundation is the agency that takes these kinds of risks. We support fundamental science and engineering at a point in the road to discovery where that path is anything but clear. We fund trailblazers. It's why the U.S. continues to be a global leader in advancing knowledge."

"The Advanced LIGO detectors are a tour de force of science and technology, made possible by a truly exceptional international team of technicians, engineers, and scientists," says David Shoemaker of MIT, the project leader for Advanced LIGO. "We are very proud that we finished this NSF-funded project on time and on budget, and delighted Advanced LIGO delivered its groundbreaking detection so quickly."

At each observatory, the two-and-a-half-mile (4-km) long L-shaped LIGO interferometer uses laser light split into two beams that travel back and forth down the arms (four-foot diameter tubes kept under a near-perfect vacuum). The beams are used to monitor the distance between mirrors precisely positioned at the ends of the arms. According to Einstein's theory, the distance between the mirrors will change by an infinitesimal amount when a gravitational wave passes by the detector. A change in the lengths of the arms smaller than one-ten-thousandth the diameter of a proton (10⁻¹⁹ meter) can be detected.

Independent and widely separated observatories are necessary to determine the direction of the event causing the gravitational waves, and also to verify that the signals come from space and are not from some other local phenomenon.

A network of detectors will significantly help to localize the sources. The Virgo detector will be the first to join later this year.

The LIGO Laboratory also is working closely with scientists in India at the Inter-University Centre for Astronomy and Astrophysics, the Raja Ramanna Centre for Advanced Technology, and the Institute for Plasma to establish a third Advanced LIGO detector on the Indian subcontinent. Awaiting approval by the government of India, it could be operational early in the next decade. The additional detector will greatly improve the ability of the global detector network to localize gravitational-wave sources.

Virgo research is carried out by the Virgo Collaboration, consisting of more than 250 physicists and engineers belonging to 19 different European research groups: 6 from Centre National de la Recherche Scientifique (CNRS) in France; 8 from the Istituto Nazionale di Fisica Nucleare (INFN) in Italy; 2 in The Netherlands with Nikhef; the Wigner RCP in Hungary; the POLGRAW group in Poland, and the European Gravitational Observatory (EGO), the laboratory hosting the Virgo detector near Pisa in Italy.



San Francisco Amateur Astronomers Application for New or Renewing Membership

1. Memberships, with dues payment, are for one year running from standard renewal dates of 1 July to 30 June and 1 January to 31 December.
2. Submitting appropriate dues in April, May, June, July, August, September, membership will run to 30 June of the next year.
3. Submitting appropriate dues in October, November, December, membership will run to 31 December of the next year; submitting appropriate dues in January, February or March, membership will run to 31 December of the same year.
4. Renewals are maintained at the original membership date unless the renewal is made later than the original cutoff date (e.g. September or March as described in 3). In such cases the membership date is shifted to the next renewal date 30 June or 31 December.
5. New or renewal memberships sent in via USPS mail will have membership start date based on postmark date.

This application is for:

- New
- Renewing

Name: _____

Address: _____

Email: _____

Home Telephone (optional): _____

Cell Phone (optional): _____

Membership Type: Individual \$25.00 / Family \$30.00 / Student \$10.00 / Supporting \$75.00

Please mail to me a Mt. Tamalpais Parking Permit

To complete the membership process:

- A. Print and fill out this form
- B. Make check or money order payable to San Francisco Amateur Astronomers
- C. Mail this form and payment to:

Treasurer, SFAA
PO Box 15097
San Francisco, CA 94115

New members will be entered onto the SFAA roster on the Night Sky Network (NSN) and will receive a verifying email from the NSN with username and password for the NSN. Renewing members will have their information updated but will not receive an email from the NSN. Both new and renewing members will receive a verifying email from the SFAA Treasurer upon completion of the membership process.