

ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

Vol. 63, No. 11 - November 2015

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

SFAA's General Meetings occur on the 3rd **TUESDAY** of each month (except January)

November 17, 2015

AARON LEE, UC BERKELEY ENDING THE DARK AGES: THE UNIVERSE'S FIRST STARS



Our Universe is 14 billion years of age, and has generally been filled with stars and starlight. We here on Earth orbit one such star, which has been shining brightly for almost 5 billion years. But what about the “first” star. How did it form? What did it look like? What was the Universe like when this star starting bringing the Universe from a place of darkness to one filled with starlight? In this talk, we will explore how stars form and evolve, and how their environments play a significant role in their development. We will then look especially at the Universe half of a billion years after the Big Bang, when these first stars began to form. We now believe that these first stars were thousands to millions of times brighter than our own Sun, but live for less than a few million years. Nonetheless, these stars played a significant role in the development and evolution of the Universe, as well as the eventual development of intelligent

life.

Aaron Lee is a graduate student astronomer and dissertation fellow at the University of California Berkeley. His research focuses on the formation and evolution of both stars and planets across all of cosmic time, as well as the pedagogical methods used in teaching undergraduate and graduate level astronomy courses. Currently, Aaron is researching the formation of the first stars ever to form in our Universe.

Aaron researches the formation of planets and stars using some of the most powerful supercomputers in the world, often utilizing thousands of individual computers working simultaneously to simulate the flow of gas and radiation over millions of years. Using these computers, Aaron sifts through hundreds of terabytes of data in order to complete his research, which has been published in leading astronomical journals.



UPCOMING LECTURES

December 15

**GREGORY T. DELORY, SR. FELLOW, SPACE SCIENCES LAB, UC BERKELEY
PRINCIPAL INVESTIGATOR, NASA MARS INSTRUMENT DEVELOPMENT**

WATER, WATER EVERYWHERE - FROM THE EARTH, THE MOON, MARS AND BEYOND



Water, essential for life as we know it, is an important indicator of the conditions present on other planets and moons throughout recent history and in the distant past. The presence and state of water and other similar volatile compounds throughout our own solar system provides insight into its formation, and the origin of the life-sustaining environments that it supports.

The fact that water is found in otherwise extreme environments on other planets and moons may indicate the presence of active, dynamic processes at work that serve to replenish this otherwise fragile, volatile resource. Water is also a potential resource that future human space missions can utilize in order to engage in the sustainable exploration of our solar system.

In this talk, Delory will discuss the significance of recent discoveries of water in the most unlikely of places - our own Moon - and what this means for our understanding of how both the Moon and our solar system have evolved over time. Mars represents the converse case - whereas it was no great surprise to find water there, it is likely that a significant amount of it was lost over time. The importance and value of observations from recent space missions in addressing these questions will be discussed, as we seek to understand more about our own origins as well as our future destinations beyond Earth.

SFAA 2015 STAR PARTY DATES FOR BALANCE OF YEAR Scott Miller

Set forth below are the scheduled San Francisco City Star Parties staffed by volunteers of the SFAA for the balance of 2015. Note that the Presidio, our new host for SFAA meetings during the Randall Museum renovation, is a favored Star Party location. Lands End, a traditional City Star Party location, and the popular Exploratorium museum, are the other Star Party sites.

Saturday	November 21 – 5:30 PM	Lands End
Saturday	December 19 – 5:30 PM	Presidio Parade Grounds



NOMINATIONS OPEN FOR SFAA OFFICERS AND BOARD OF DIRECTORS

The Officers and Board of Directors of the San Francisco Amateur Astronomers are responsible for planning and coordinating club activities -- including our meetings, star parties, school programs, telescope loan program, telescope making workshop, liaison with media and other community organizations, and other outreach and public education activities -- as well as the behind-the-scenes work involved in running a 501(c)3 nonprofit educational organization. Officers and board members for the 2016 calendar year will be elected at our December 15, 2015 General Meeting.

The offices are: President, Vice President, Treasurer, Secretary, seven Directors, and two Alternate Directors. Here are the board's nominees:

President, Michael Patrick

Vice President, Matt Jones

Treasurer, Katie Gallinger

Secretary, Anthony Barreiro

*Directors:
PJ Cabrera
Anil Chopra
Brian Kruse
Scott Miller
Agnes Pырchla
Paul Salazar
Douglas Smith*

We need at least three more nominees for Director and Alternate Director. Nominations for Officers would also be welcome.

You must be a current member of SFAA to be eligible to serve as an officer or director. The officers and board meet monthly, either in person or via teleconference. Officers and board members need to attend these meetings and be available to help plan and carry out club activities.

SFAA is growing in membership and visibility. As a completely volunteer-run organization we depend on the active participation of members to achieve our mission of promoting and popularizing astronomy and related disciplines. The current officers and board welcome and encourage all SFAA members to consider serving as officers and directors. Ideal candidates have both a love of astronomy and public outreach and a sincere commitment to do the work needed to keep a large and active club running successfully.

More information about the duties of officers and directors can be found at <http://www.sfaa-astronomy.org/sfaa-bylaws/> .

If you are willing to serve as an officer or director, if you would like to nominate another member, or if you have questions, please send an email to SFAA Secretary Anthony Barreiro, anthonybarreiro@yahoo.com .

Printed nomination forms will also be distributed to members at the November 17, 2015 General Meeting.



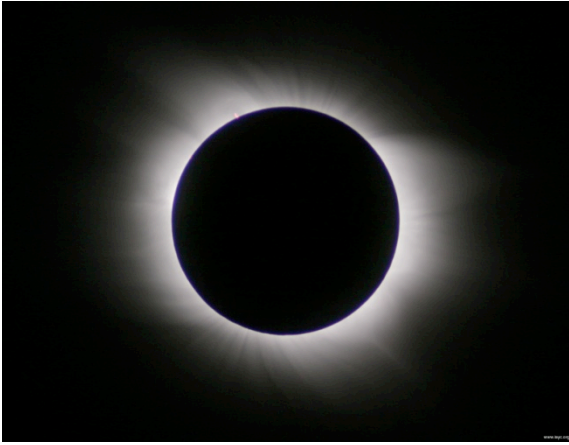
Monday October 19 San Francisco Amateur Astronomers Dominican University Event

By Katie Gallinger

This month volunteers from the SFAA again took part in the Dominican University's class titled "Big History". Volunteers set up telescopes and gave an informal lecture to a lawn full of engaged students, many of whom brought blankets to sit on and popcorn to snack. The class is a required course for all incoming freshman and aims to contextualize the students' lives by examining the known history of our universe--starting with the Big Bang on through today.



The SFAA attempted to demonstrate our specific place in the wonderfully-unfolding Universe, however 'it was not in the stars' this time. Cloud cover and light sprinkles allowed for only occasional viewing of the Moon, with various stars peaking their way out of the clouds a handful of times. Although the observing wasn't stellar, a nice time was had by all, with various students sticking it out through rain, after the crowd had dispersed, hoping to peer deeper into the universe.



SAN FRANCISCO AMATEUR ASTRONOMERS EXPEDITION

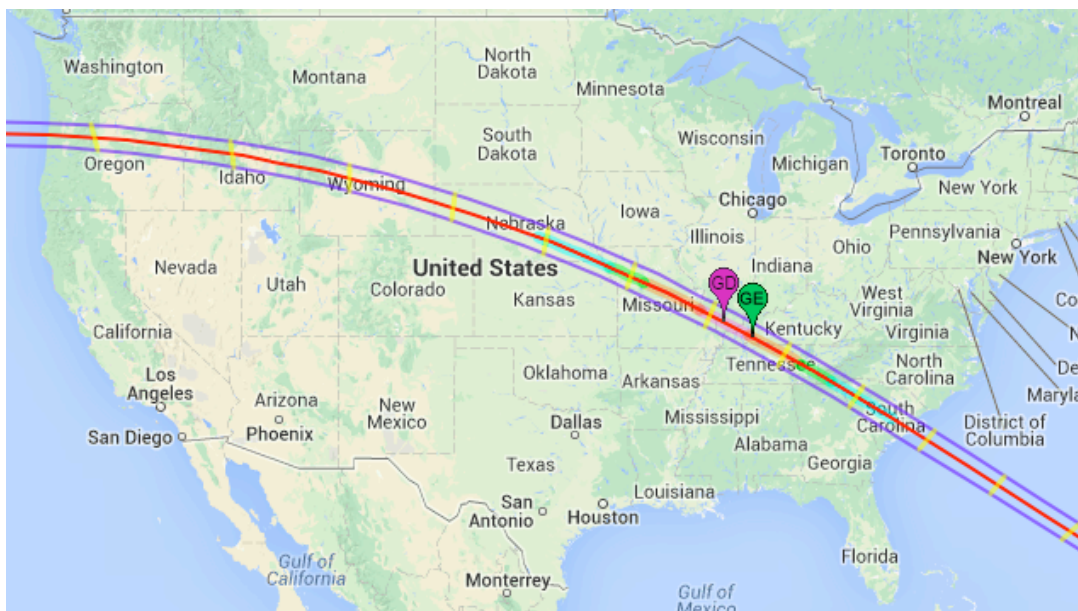
August 21, 2017

**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

<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**

**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.

**EVERY FRIDAY &
SATURDAY EVENING,
weather permitting
7:30 PM – 10:30 PM**

**CHABOT SPACE AND
SCIENCE CENTER
10000 Skyline Boulevard
Oakland CA 94619-2450
(510) 336-7300**

EXPLORE THE NIGHT SKIES AT THE CHABOT OBSERVATORIES

For more information: <http://www.chabot.space.org/>

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!

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)

12pm - 5pm: Observatories Open

<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</p> <p>If you have kids interested in space or planets bring them here for a real life view of planets, nebula, star clusters and galaxies.</p> <p>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</p> <p>Dress warmly and wear a hat.</p> <p>Visitors should park on the street and walk into the park so your headlights don't affect the observer's dark adaptation.</p> <p>Only park in the parking lot if you are arriving before dark and plan to stay until the end of the event.</p> <p>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.</p> <p>Please respect the telescopes and ask permission from the owner if you wish to touch.</p> <p>Parents, please watch your children.</p> <p>The park is residential, and adjacent to homes and backyards, please keep noise to a minimum.</p> <p>Schedule Time</p> <p>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 10:00 AM – 12:00 PM</p> <p>FOOTHILL COMMUNITY COLLEGE OBSERVATORY 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.</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>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</p>

Cost: Free	the sky.
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BAY AREA EVENTS - NOVEMBER 2015

<p>THURSDAY, 11/12/15 7:00 PM</p> <p>SANTA CRUZ ASTRONOMY CLUB HARVEY WEST SCOUT HOUSE 326 Evergreen St Santa Cruz</p> <p>Cost: Free</p>	<p>GALACTIC EVOLUTION</p> <p>Raja Guha Thakurta (PhD in Astrophysical Sciences, Princeton, 1989) is a professor of astronomy and astrophysics at UCSC. Guha Thakurta's research focuses on the formation and evolution of galaxies, large and small, near and far, through detailed studies of their assembly history, galaxy cannibalism, dynamics and dark matter content, chemical enrichment, and star-formation history. His research group studies the Andromeda galaxy (lead: SPLASH and M31AGES surveys; spectroscopy lead: PHAT survey), Milky Way galaxy (lead: HALO7D project), and many other galaxies in the Local Volume (e.g., spectroscopy leads: NGVS, SMAKCED, and PISCeS surveys). The group frequently uses the Keck telescope and Hubble Space Telescope.</p>
<p>Friday, 11/13/15 12:00 NOON</p> <p>COMMONWEALTH CLUB 555 Post St San Francisco</p> <p>Cost:</p> <p>\$20 General Free for Members \$7 Students</p>	<p>THE ORBITAL PERSPECTIVE</p> <p>Sam Garan, a retired NASA astronaut who logged 178 days in space and 71 million miles in orbit, will discuss his perspective of his experience as an astronaut and his time spent on the International Space Station. He was a long-term resident of the ISS, where he lived and worked with U.S. and Russian crewmates. He also served aboard the space shuttle Discovery. He left NASA in 2013, but not before becoming the first person ever to give a TED Talk from space.</p> <p>Today Garan applies three-dimensional thinking, or "the orbital perspective," to long-term global problem solving – working, primarily, to create a more sustainable, peaceful planet, and combat world hunger, thirst and poverty.?</p> <p>As founder of Manna Energy Foundation, a nonprofit social-enterprise incubator, Garan helps address the developing world's need for fresh water, renewable energy and access to communications. He started Fragile Oasis, a one-of-a-kind humanitarian initiative connecting Earth dwellers with astronauts in space.</p>
<p>FRIDAY, 11/13/15 7:30 PM</p> <p>PENINSULA ASTRONOMICAL SOCIETY FOOTHILL COLLEGE Room 5015 Los Altos Hills</p> <p>Cost:</p> <p>Free (\$3 Parking)</p>	<p>DR. PAUL LYNAM OF LICK OBSERVATORY THE HISTORY AND SCIENCE OF LICK OBSERVATORY</p> <p>Lick Observatory, wholly owned and operated by the University of California, was the first astronomical observatory purpose-built at altitude. It demonstrated the practicality of large-scale glass substrate reflecting telescopes for research. It was the fulcrum upon which the United States pivoted to dominance in observational astronomy at the close of the 19th century and the dawn 20th.</p> <p>This presentation offers a little known history of James Lick, what motivated him to establish Lick Observatory and the processes and people that lead to</p>

	<p>the establishment of what was for decades the world's foremost astronomical observatory, located in the county of Santa Clara. Even prior to completion, Lick Observatory was making important discoveries, developing technologies and setting standards. It continues to train generations of scientists and inspire the wider public --- a role it has fulfilled for over 100 years. Lick remains at the forefront of scientific and technological advances, annually enabling over 200 Californian astronomers to undertake and publish front line, cutting edge research. Lick continues to pioneer and has much more work to do.</p> <p>Some outstanding contributions from Lick's history and current work shall be highlighted, as well as some prospects for the future.</p>
<p>Monday, 11/16/15 11:00 AM - 12:00 NOON</p> <p>KAVLI INSTITUTE ASTROPHYSICS COLLOQUIUM VARIAN PHYSICS BUILDING Room 355 382 Via Pueblo Mall Stanford, CA 94305</p> <p>Cost: Free</p>	<p>CIRO PINTO, UNIVERSITY OF CAMBRIDGE THE FIGHT BETWEEN COOLING AND HEATING IN CLUSTERS OF GALAXIES</p> <p>Clusters of galaxies are the largest gravitationally-bound individual objects in the Universe. The vast majority of their baryonic mass is found in the form of hot 10^6-8 K gas, known as the intracluster medium (ICM). The density of this gas strongly increases in the cores of the galaxies where the radiative cooling time is less than 1 Gyr. Theoretical models predict large mass deposition of up to 100s of solar masses per year in the cores of these objects. Such high values are not detected, in particular there is a significant lack of cool gas below $6 \cdot 10^6$ K, presumably due to heating produced by galaxy mergers, sloshing of gas within the gravitational field or most likely by the tremendous amount of energy that is thrown by matter accreting on the supermassive (10^6-9 Msun) black holes host in the centers of the galaxies. It is still under debate which of these scenarios is most feasible, but possibly each of them is relevant at certain galactic or cluster scales. I will provide a summary of the current state of art and show some recent discoveries that shed new light on the processes responsible for the balance between gas heating and cooling in clusters of galaxies. Particular focus is given on advanced techniques in high-resolution X-ray spectroscopy, which will be crucial with the launch of the new X-ray mission ASTRO-H and the preparation of the ATHENA X-ray satellite, the new frontier of X-ray astronomy.</p>
<p>MONDAY, 11/16/15 7:00 PM</p> <p>HEWLETT TEACHING CENTER STANFORD UNIVERSITY Room 201 Palo Alto, CA 94305</p> <p>Cost: Free</p>	<p>SAVAS DIMOPOULOS, STANFORD PARTICLE PHYSICS IN THE 21ST CENTURY' MINI-LECTURE COURSE LECTURE 2 OF 2</p> <p>The discovery of the Higgs particle at the Large Hadron Collider in 2012 completes the Standard Model of particle physics, which successfully accounts for almost all phenomena observed in the universe. Professor Dimopoulos will overview this model and some of the deep questions that suggest going beyond it to theories with extra dimensions, supersymmetry, string theory and the multiverse.</p>
<p>TUESDAY, 11/17/15 11:30 AM</p> <p>GALILEO AUDITORIUM MICROSOFT SVC</p>	<p>CONNECTED EXPLORATION ERIC STACKPOLE OPENROV</p> <p>Eric Stackpole will talk about the new possibilities for exploration using the</p>

<p>BUILDING ONE 1065 La Avenida Mountain View</p>	<p>OpenROV underwater platform.</p> <p>The face of exploration is changing. Affordable tools, open standards, and connected enthusiasm are opening up new possibilities for the frontiers of discovery. OpenROV has created a low-cost, submersible Remotely Operated Vehicle that allows everyday people to explore previously unseen parts of the underwater world. By expanding the group of people with access to capable tools, we hope to democratize exploration and drastically increase the number of discoveries being made about the depths of our planet.</p>
<p>TUESDAY 11/ 17/15 7:30 PM</p> <p>PANOFSKY AUDITORIUM (THE NEW SCIENCE AND USER SUPPORT BUILDING) STANFORD LINEAR ACCELERATOR CENTER 2575 Sand Hill Rd Menlo Park</p>	<p>ANDREA ALBERT, SLAC COSMIC CLUE: THE DARK MATTER MYSTERY</p> <p>The universe is full of giant structures like galaxies and clusters of galaxies. What holds them together? Over the past century, many diverse observations indicate that the glue holding these objects together is the gravitational pull of an invisible, elusive substance called dark matter. The evidence suggests that dark matter makes up 85 percent of the matter in the universe. But, though we know that this dark matter exists, we do not know what it is. This lecture will sift through the evidence on dark matter using the same questions invoked to solve a murder mystery in the game Clue: Who? Where? What? Could the answers be "Neutralino, in a dwarf galaxy, seen with gamma rays"? Our game of Cosmic Clue is ongoing and scientists are hot on the trails of a number of suspects.</p> <p>Andrea Albert first learned about the mysterious dark matter of the universe in high school. As an undergraduate at Rice University, she became fascinated with this and other questions on the boundary between astrophysics and particle physics. She went to graduate school at the Ohio State University, where she joined the Fermi Gamma-ray Space Telescope group to search for rare, faint signals from dark matter interactions. She continues this research at SLAC, where she is also working on the design of a next-generation gamma-ray telescope.</p> <p>Registration is no longer required! Please RSVP here to receive reminders: https://docs.google.com/forms/d/1dWIZzfnl3pJqEohR3QmQZyw6thdht1m2jxjfCB_jNs/viewform</p> <p>Watch the live stream on November 17th, 2015, 7:30 pm http://www.ustream.tv/channel/publiclecture</p>
<p>TUESDAY, 11/17/15 11:30 AM</p> <p>GALILEO AUDITORIUM MICROSOFT SVC BUILDING ONE 1065 La Avenida Mountain View</p>	<p>CONNECTED EXPLORATION ERIC STACKPOLE OPENROV</p> <p>Eric Stackpole will talk about the new possibilities for exploration using the OpenROV underwater platform.</p> <p>The face of exploration is changing. Affordable tools, open standards, and connected enthusiasm are opening up new possibilities for the frontiers of discovery. OpenROV has created a low-cost, submersible Remotely Operated</p>

	<p>Vehicle that allows everyday people to explore previously unseen parts of the underwater world. By expanding the group of people with access to capable tools, we hope to democratize exploration and drastically increase the number of discoveries being made about the depths of our planet.</p>
<p>Tuesday, 11/17/15 7:00 PM</p> <p>JEWISH COMMUNITY CENTER 3200 California Street San Francisco</p> <p>DARK MATTER AND DINOSAURS</p> <p>Cost: \$27 - \$37</p>	<p>Harvard professor Lisa Randall (Warped Passages, Knocking on Heaven's Door) is among our most influential theoretical physicists. Her new book, Dark Matter and the Dinosaurs, explores the consequences of the comet responsible for the dinosaurs' extinction, speculates about other possible missing elements and illustrates the importance of preserving the elements on Earth that are vital to our existence.</p> <p>Series subscription prices available 7/27. Single tickets 8/17.</p> <p>Website: https://www.jccsf.org/arts-ideas/lectures/science-technology/dark-matter-and-dinosaurs/</p>
<p>SATURDAY, 11/21/15 11:00 AM - 12:00 PM</p> <p>GENETICS AND PLANT BIOLOGY BUILDING UC BERKELEY Room 100 Berkeley, CA 94720</p> <p>Cost: Free</p>	<p>ITAY BUDIN, UC BERKELEY GENESIS ON THE BENCHTOP: HOW DO WE STUDY THE ORIGIN OF LIFE IN THE LAB?</p> <p>The origin of life is a topic that has driven scientific research from many disciplines, ranging from astronomy to organic chemistry. Molecular biology has revealed that all life on earth shares a common ancestor, yet we know little about how those first cells arose. In this talk I will focus on laboratory efforts to understand how pools of molecules can organize and transition into biological systems capable of Darwinian evolution. A long-term goal of this research is to build simple, self-replicating cells in the lab. While this synthetic approach cannot tell us how life on Earth began, it can shed light on the conditions needed for biology to arise - and the likelihood that it has arisen elsewhere.</p>

ARTICLES OF INTEREST

CASSINI SEEKS INSIGHTS TO LIFE IN PLUMES F ENCELADUS, SATURN'S ICY MOON

The New York Times

http://www.nytimes.com/2015/10/29/science/space/in-icy-breath-of-saturns-moon-enceladus-cassini-hunts-for-life.html?ref=space&_r=0

NASA ANTARES ROCKET EXPLOSION

Business Insider

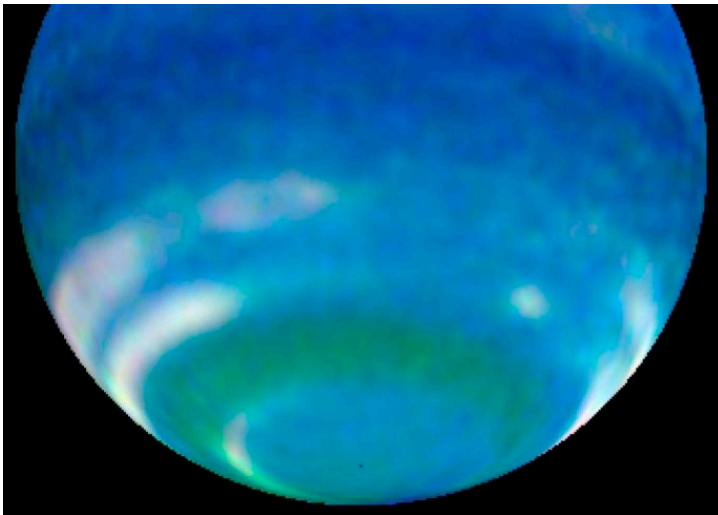
<http://www.businessinsider.com/nasa-photos-of-orbital-atk-antares-rocket-explosion-2014-2015-11>

MARS' ATMOSPHERE STRIPPED BY SOLAR WINDS, NASA SAYS

The New York Times

<http://www.nytimes.com/2015/11/06/science/space/mars-atmosphere-stripped-away-by-solar-storms-nasa-says.html?ref=space>

NASA SCIENCE NEWS



WORLDS WITHIN WORLDS: HUBBLE PEELS BACK THE LAYERS OF A WARM NEPTUNE

Oct. 31, 2015: They say you can't judge a book by its cover. But what about planets?

Take Neptune for example. For many years, especially since 1989 when Voyager 2 flew past Neptune and measured its gravity field, astronomers have known that the blue giant

harbors a secret world inside. Hidden deep below the azure cloud tops lies a rocky core not much larger than Earth. Uranus has one, too! These "worlds within worlds" could have exotic properties including scorching hot oceans and diamond rain.

<https://youtu.be/TbWX7-ZoJAK>

Astronomers using NASA's Hubble Space Telescope have discovered an immense cloud of hydrogen evaporating from a Neptune-sized planet named GJ 436b. The planet's atmosphere is evaporating because of extreme irradiation from its parent star.

About 30 light years away, a Neptune-sized planet is having some of its layers peeled back.

"This cloud is spectacular," says the study's leader, David Ehrenreich of the Observatory of the University of Geneva in Switzerland. "The research team has nicknamed it 'The Behemoth.'"

The planet's atmosphere is evaporating because of extreme irradiation from its parent star—a process that might have been even more intense in the past.

"The parent star, which is a faint red dwarf, was once more active," says Ehrenreich. "This means that the planet's atmosphere evaporated faster during its first billion years of existence. Overall, we estimate that the planet may have lost up to 10 percent of its atmosphere."

GJ 436b is considered to be a "Warm Neptune" because of its size and because it is much closer to its parent star than Neptune is to our own sun. Orbiting at a distance of less than 3 million miles, it whips around the central red dwarf in just 2.6 Earth days. For comparison, the Earth is 93 million miles from the sun and orbits it every 365.24 days.

Systems like GJ 436b could explain the existence of so-called "Hot Super-Earths."

"Hot Super-Earths" are larger, hotter versions of our own planet. Space telescopes such as NASA's Kepler and the French led CoRoT have discovered hundreds of them orbiting distant stars. The existence of The Behemoth suggests that Hot Super-Earths could be the remnants of Warm Neptunes that completely lost their gaseous atmospheres to evaporation.

Finding a cloud around GJ 436b required Hubble's ultraviolet vision. Earth's atmosphere blocks most ultraviolet light so only a space telescope like Hubble could make the crucial observations.

"You would not see The Behemoth in visible wavelengths because it is optically transparent," says Ehrenreich. On the other hand, it is opaque to UV rays. "So when you turn the ultraviolet eye of Hubble onto the system, it's really kind of a transformation because the planet turns into a monstrous thing."

The ultraviolet technique could be a game-changer in exoplanet studies, he adds. Ehrenreich expects that astronomers will find thousands of Warm Neptunes and Super-Earths in the years ahead. Astronomers will want to examine them for evidence of evaporation. Moreover, the ultraviolet technique might be able to spot the signature of oceans evaporating on Earth-like planets, shedding new light on worlds akin to our own.

Maybe you can't judge a book by its cover, but you can judge a planet by its Behemoth.

WHOPPING GALAXY CLUSTER SPOTTED WITH HELP OF NASA TELESCOPES



The galaxy cluster called MOO J1142+1527 can be seen here as it existed when light left it 8.5 billion years ago. The red galaxies at the center of the image make up the heart of the galaxy cluster. Image credit: NASA/JPL-Caltech/Gemini/CARMA

Nov 3, 2015: Astronomers have discovered a giant gathering of galaxies in a very remote part of the universe, thanks to NASA's Spitzer Space Telescope and Wide-field Infrared Survey Explorer (WISE). The galaxy cluster, located 8.5 billion light-years away, is the most massive structure yet found at such great distances.

Galaxy clusters are gravitationally bound groups of thousands of galaxies, which themselves each contain hundreds of billions of stars. The clusters grow bigger and bigger over time as they acquire new members.

How did these clusters evolve over time? What did they look like billions of years ago? To answer these questions, astronomers look back in time to our youthful universe. Because light takes time to reach us, we can see very distant objects as they were in the past. For example, we are seeing the newfound galaxy cluster -- called Massive Overdense Object (MOO) J1142+1527 -- as it existed 8.5 billion years ago, long before Earth formed.

As light from remote galaxies makes its way to us, it becomes stretched to longer, infrared wavelengths by the expansion of space. That's where [WISE](#) and [Spitzer](#) help out.

For infrared space telescopes, picking out distant galaxies is like plucking ripe cherries from a cherry tree. In the infrared images produced by Spitzer, these distant galaxies stand out as red dots, while closer galaxies look white. Astronomers first combed through the WISE catalog to find

candidates for clusters of distant galaxies. WISE catalogued hundreds of millions of objects in images taken over the entire sky from 2010 to 2011.

They then used Spitzer to narrow in on 200 of the most interesting objects, in a project named the "Massive and Distant Clusters of WISE Survey," or MaDCoWS. Spitzer doesn't observe the whole sky like WISE, but can see more detail.

"It's the combination of Spitzer and WISE that lets us go from a quarter billion objects down to the most massive galaxy clusters in the sky," said Anthony Gonzalez of the University of Florida in Gainesville, lead author of a new study published in the Oct. 20 issue of the Astrophysical Journal Letters.

From these observations, MOO J1142+1527 jumped out as one of the most extreme.

The W.M. Keck Observatories and Gemini Observatory on Mauna Kea in Hawaii were used to measure the distance to the cluster at 8.5 billion light-years. Using data from the Combined Array for Research in Millimeter-wave Astronomy (CARMA) telescopes near Owens Valley in California, the scientists were then able to determine that the cluster's mass is a quadrillion times that of our sun -- making it the most massive known cluster that far back in space and time.

MOO J1142+1527 may be one of only a handful of clusters of this heft in the early universe, according to the scientists' estimates.

"Based on our understanding of how galaxy clusters grow from the very beginning of our universe, this cluster should be one of the five most massive in existence at that time," said co-author Peter Eisenhardt, the project scientist for WISE at NASA's Jet Propulsion Laboratory in Pasadena, California.

In the coming year, the team plans to sift through more than 1,700 additional galaxy cluster candidates with Spitzer, looking for biggest of the bunch.

"Once we find the most massive clusters, we can start to investigate how galaxies evolved in these extreme environments," said Gonzalez.

JPL managed and operated WISE for NASA's Science Mission Directorate in Washington. In September 2013, WISE was reactivated, renamed NEOWISE and assigned a new mission to assist NASA's efforts to identify potentially hazardous near-Earth objects. JPL manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington. Science operations and data processing for Spitzer and NEOWISE take place at the Infrared Processing and Analysis Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.

More information about WISE is online at:

<http://www.nasa.gov/wise>

More information about Spitzer is online at:

<http://www.nasa.gov/spitzer>

<http://spitzer.caltech.edu>



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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.

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

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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:

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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.