



Vol. 64, No. 9 – September 2016

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**CALL FOR VOLUNTEERS**

SFAA is looking for volunteers to join the Editorial Team for the Above The Fog newsletter. Our dynamic team is looking for new members. Please send an email to Michael Patrick at [president@sfaa-astronomy.org](mailto:president@sfaa-astronomy.org) if you're interested.

# 01.

## SEPTEMBER 20<sup>TH</sup> LECTURE | DR. LYNN COMINSKY

THE PRESIDIO . OBSERVATION POST . BUILDING 211

211 Lincoln Boulevard, San Francisco

7:00 pm Doors Open | 7:30 pm Light Refreshments | 7:45 pm Announcements | 8:00 pm Speaker

SFAA'S GENERAL MEETINGS OCCUR ON THE 3<sup>RD</sup> TUESDAY OF EACH MONTH (EXCEPT JANUARY)

### “SPACETIME SYMPHONY: GRAVITATIONAL WAVES FROM MERGING BLACK HOLES”



#### DR. LYNN COMINSKY

Chair, Physics and Astronomy Department,  
Sonoma State University

In September 2015, the Laser Interferometer Gravitational-wave Observatory (LIGO) detected the first gravitational wave signals. The event represents the coalescence of two distinct black holes that were previously in mutual orbit.

LIGO's exciting discovery provides direct evidence of what is arguably the last major unconfirmed prediction of Einstein's General Theory of Relativity, and has launched the new field of gravitational wave astronomy.

Professor Cominsky will report on these recent observations and discuss the merging Black Hole binary system that created these waves.

*Lynn Cominsky has been on the faculty at Sonoma State University for over 30 years and is Chair of the Department of Physics and Astronomy.*

*She is a NASA Fermi Astrophysicist with decades of research experience, and Fermi Press Officer, for Education and Public Outreach. She has been a Guest Investigator on many X-ray and Gamma-Ray satellite experiments, analyzing data on Neutron Star binaries and X-ray Bursts.*

Please see the following page for a simulated image and brief description of the concepts Dr. Cominsky will be discussing.

## Two Black Holes Merge into One

[Image Credit: SXS, the Simulating eXtreme Spacetimes (SXS) project (<http://www.black-holes.org>)]  
[Article credit: LIGO Caltech website]



The collision of two black holes—a tremendously powerful event detected for the first time ever by the Laser Interferometer Gravitational-Wave Observatory, or LIGO—is seen in this still from a computer simulation. LIGO detected gravitational waves, or ripples in space and time generated as the black holes spiraled in toward each other, collided, and merged. This simulation shows how the merger would appear to our eyes if we could somehow travel in a spaceship for a closer look. It was created by solving equations from Albert Einstein's general theory of relativity using the LIGO data.

The two merging black holes are each roughly 30 times the mass of the sun, with one slightly larger than the other. The event took place 1.3 billion years ago.

The stars appear warped due to the incredibly strong gravity of the black holes. The black holes warp space and time, and this causes light from the stars to curve around the black holes in a process called gravitational lensing. The ring around the black holes, known as an Einstein ring, arises from the light of all the stars in a small region behind the holes, where gravitational lensing has smeared their images into a ring.

The gravitational waves themselves would not be seen by a human near the black holes and so do not show in this video, with one important exception. The gravitational waves that are traveling outward toward the small region behind the black holes disturb that region's stellar images in the Einstein ring, causing them to slosh around, even long after the collision. The gravitational waves traveling in other directions cause weaker, and shorter-lived sloshing, everywhere outside the ring.

# 02.

## UPCOMING SFAA LECTURES 2016

**OCTOBER 18<sup>TH</sup> | ANDREW WESTPHAL, UC BERKELEY SPACE SCIENCES LAB**  
"STARDUST: ANALYSIS OF COMETARY AND INTERSTELLAR DUST IN THE LAB"



Stardust was the first spacecraft to collect dust samples from following Comet Wild-2, followed by 200 days of collecting samples of the interstellar dust stream.

Dr. Westphal will present the most recent lab results from the return capsule.



**NOVEMBER 15<sup>TH</sup> | R. JAY GABANY, ASTROPHOTOGRAPHER**  
"GALACTIC ARCHEOLOGY: GOOD SCIENCE WITH MODEST EQUIPMENT"

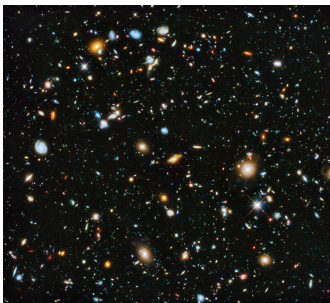


Using modest aperture, commercially produced semi-robotic telescopes under steady dark skies, GaBany produces long exposure images that reveal previously undetected merging star streams. He collaborates with a team of international astrophysicists, processing his images for over 100 hours to reveal faint details.

R. Jay GaBany is a Chambliss awardee by the American Astronomical Society.

Photo credit: R. Jay GaBany

**DECEMBER 20<sup>TH</sup> | LEO BLITZ, UC BERKELEY DEPARTMENT OF ASTRONOMY**  
"ARE ANCIENT GALAXIES REALLY RED AND DEAD?"



Galaxies are generally observed as spiral and elliptical shapes. The early type elliptical galaxies, with their old stars, are seen as reddish and often referred to as 'red and dead.' We will learn that some of these galaxies hold surprising new areas or research.

Photo credit: Hubble Ultra Deep Field 2014  
Image Credit: NASA, ESA, H.Teplitz and M.Rafelski (IPAC/Caltech), A. Koekemoer (STScI), R. Windhorst(ASU), Z. Levay (STScI)

# 03.

## **SFAA PRESIDENT'S NOTE | THE SFAA IS LOOKING FOR TALENT AND TIME**

We organize City Star Parties for the public 12 months a year; Mt. Tamalpais Star Parties for Members Only and the Public 18 times a year; contact speakers and schedule public lectures 11 times a year, organize light snacks and drinks for a 'meet and greet' before the lectures; organize 'Observing Basics' and bring observing equipment to meeting/lectures 4 times a year; organize a weekend at Yosemite and a tour of Lick Observatory once a year; organize a members annual recognition party once a year; organize, design, write, contribute and publish a newsletter 12 times a year; coordinate with schools and libraries and other public institutions for outreach education about astronomy, donating time (pretty much evenings but not always) and bring our telescopes for public observation at multiple locations in the Bay Area; are organizing a 2017 total Solar Eclipse event to be held in Jackson Hole, Wyoming and ordering protective 'eclipse viewing glasses' for distribution; design, order and distribute a handsome SFAA T-shirt; coordinate telescope making events throughout the year; participate in annual Astronomy Day activities; have developed relationships with other Bay Area (and some beyond) astronomy related organizations; process SFAA memberships via internet and USPS mail (118 new memberships, 83 renewals processed and 94 Mt. Tam parking passes mailed this year so far); maintain a number of different types of telescopes for loan to members and provide associated equipment for their operation; develop and maintain a website for current information about the SFAA and its activities and member benefits; conducted a survey of members to better serve their needs and interests (more on this later); maintain a database for members and send out informational emails; have gone through the (very long) process of establishing the SFAA as a 501(c)(3) non-profit organization such that membership fees can be tax deductible to the extent permitted by law and file a tax return as a 501(c)(3); and establish and maintain necessary liability insurance to cover our events and meet our partner requirements.

I feel sure I have missed a number of items that the SFAA does for its' members and the public, but the above gives a good idea of what we do.

**All of the above – and more - is done by 13 people.**

We are looking for members who would like to contribute to what I have listed, and more, with their time and talent. If you feel you have both, and have ideas on how the SFAA could expand its' services to members and the public, and are the kind of person who likes to 'get things done' and build an organization with even higher visibility and impact, well, we would like to hear from you!

If you are interested, please contact us at any of the following email addresses listed below.

Dark, clear and stable skies,

**Michael Patrick**  
**President, SFAA**

### **SFAA Board Officers and Directors:**

President	Michael Patrick	president@sfaa-astronomy.org
Vice President	Matthew Jones	vice-president@sfaa-astronomy.org
Treasurer	Katie Gallinger	treasurer@sfaa-astronomy.org
Secretary	Anthony Barreiro	secretary@sfaa-astronomy.org
Directors:	PJ Cabrera, Anil Chopra, Brian Kruse, Scott Miller, Agnes Pырchla, Douglas Smith, Liz Triggs, Paul Salazar	

# 04.

## SFAA ASTROPHOTOGRAPY GALLERY



Photo credit: Agnes Pырchla, Joshua Tree National Park

Calling all astrophotographers! The SFAA Board is excited to announce the new astrophotography gallery in the newsletter. If you have photos you are proud of or even if you are just starting in astrophotography, please share what you have and we can share it!

### Here are the details:

- 1. Who can enter?** The contest is open to both members and non-members.
- 2. What kinds of photos?** Any type of astrophotography is welcome.
- 3. What file format is preferred for submissions?** JPG or PNG formats.
- 4. What do you need to provide with each photo?** Your name, date and time of shot, description of the photo subject and type of equipment used.
- 5. Where/how are photos submitted?** Photos should be submitted by email to [president@sfaa-astronomy.org](mailto:president@sfaa-astronomy.org).
- 6. By when should I submit my photos?** Please submit all photos by the 21<sup>st</sup> of each month.
- 7. Where will my photos be featured?** Photos will be featured in the monthly newsletter.

# 05.

## SFAA EXPEDITION 2017

### TOTAL SOLAR ECLIPSE

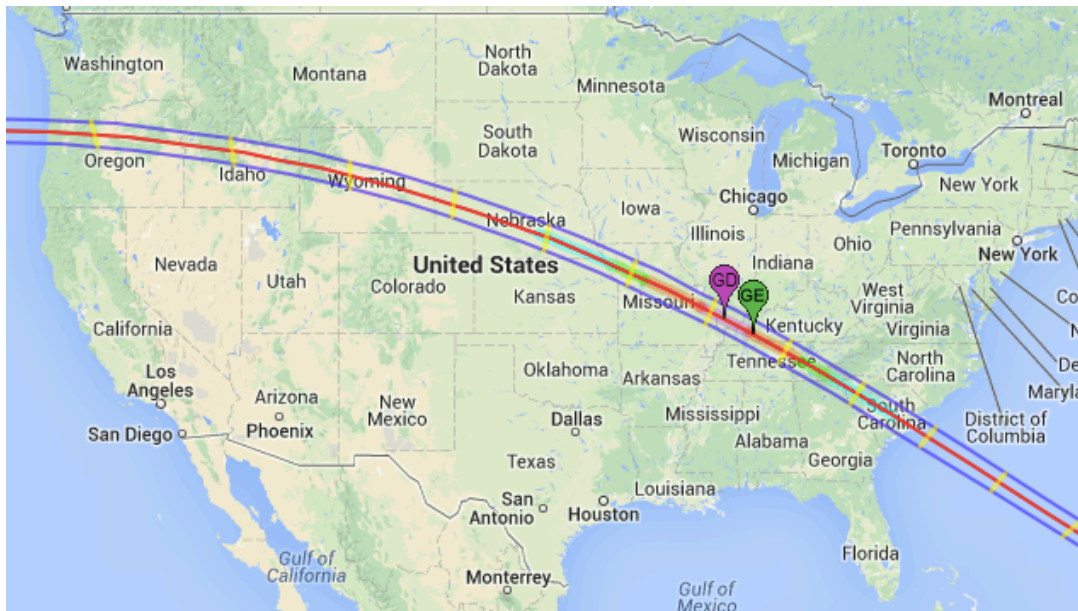
August 21, 2017

#### 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.

Over the past year as we have promoted this event, hotel space in all of the Jackson Hole region has sold out. So at this point in time, we welcome SFAA members to join us for the weekend of August 19th and 20th at our location in Teton Village, and for totality on Monday August 21st. However, you will have to find hotel or camping accommodations elsewhere and drive in. If you wish to join us or just to get updates, send an email to [2017eclipse@sfaa-astronomy.org](mailto:2017eclipse@sfaa-astronomy.org) to receive periodic updates.

If you have any other questions, send to [2017eclipse@sfaa-astronomy.org](mailto:2017eclipse@sfaa-astronomy.org).



# 06.

## ASTRONOMY EVENTS

### SAN FRANCISCO AMATEUR ASTRONOMERS EVENTS SEPTEMBER 3 – OCTOBER 18, 2016

Saturday September 3, 6:30 pm  
Mt. Tam Members Night

Thursday September 8, 6:30 pm  
City Star Party, Land's End

Saturday September 10, 6:30 pm  
Mt. Tam Public Astronomy Program

Tuesday September 20, 7:30 p.m.  
Meeting and Lecture, Presidio Observation Post

Saturday October 1, 6:00 pm  
Mt. Tam Members Night

Thursday October 6, 6:00 pm  
City Star Party, Presidio Main Parade Ground

Saturday October 8, 6:00 pm  
Mt. Tam Public Astronomy Program

Tuesday October 18, 7:30 p.m.  
Meeting and Lecture, Presidio Observation Post



## BAY AREA ASTRONOMY EVENTS

Each month, long-time SFAA member Kenneth Lum assembles and sends out a list of Bay Area Astronomy events. As each month unfolds, check the following link for information regarding additional events:

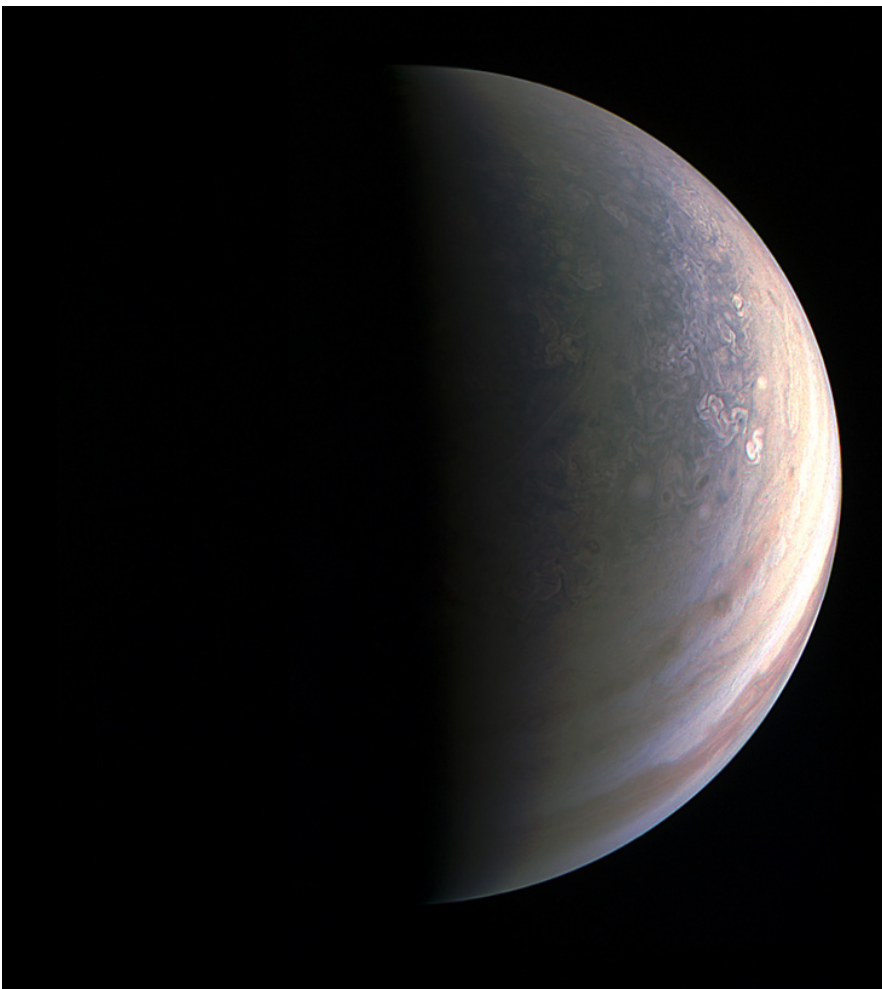
<http://tech.groups.yahoo.com/group/bayastro/?v=1&t=directory&ch=web&pub=groups&sec=dir&slk=94>



## **JUPITER'S NORTH POLE UNLIKE ANYTHING ENCOUNTERED IN SOLAR SYSTEM**

NASA's Juno spacecraft has sent back the first-ever images of Jupiter's north pole, taken during the spacecraft's first flyby of the planet with its instruments switched on. The images show storm systems and weather activity unlike anything previously seen on any of our solar system's gas-giant planets.

Juno successfully executed the first of 36 orbital flybys on Aug. 27 when the spacecraft came about 2,500 miles (4,200 kilometers) above Jupiter's swirling clouds. The download of six megabytes of data collected during the six-hour transit, from above Jupiter's north pole to below its south pole, took one-and-a-half days. While analysis of this first data collection is ongoing, some unique discoveries have already made themselves visible.



*As NASA's Juno spacecraft closed in on Jupiter for its Aug. 27, 2016 pass, its view grew sharper and fine details in the north polar region became increasingly visible.*

*The JunoCam instrument obtained this view on August 27, about two hours before closest approach, when the spacecraft was 120,000 miles (195,000 kilometers) away from the giant planet (i.e., for Jupiter's center).*

*Unlike the equatorial region's familiar structure of belts and zones, the poles are mottled with rotating storms of various sizes, similar to giant versions of terrestrial hurricanes. Jupiter's poles have not been seen from this perspective since the Pioneer 11 spacecraft flew by the planet in 1974.*

*NASA's Jet Propulsion Laboratory, Pasadena, California, manages the Juno mission for the principal investigator, Scott Bolton, of Southwest Research Institute in San Antonio. The Juno mission is part of the New Frontiers Program managed at NASA's Marshall Space Flight Center in Huntsville, Alabama. Lockheed Martin Space Systems, Denver, built the spacecraft. JPL is a division of Caltech in Pasadena.*

"First glimpse of Jupiter's north pole, and it looks like nothing we have seen or imagined before," said Scott Bolton, principal investigator of Juno from the Southwest Research Institute in San Antonio. "It's

bluer in color up there than other parts of the planet, and there are a lot of storms. There is no sign of the latitudinal bands or zone and belts that we are used to -- this image is hardly recognizable as Jupiter. We're seeing signs that the clouds have shadows, possibly indicating that the clouds are at a higher altitude than other features."

One of the most notable findings of these first-ever pictures of Jupiter's north and south poles is something that the JunoCam imager did not see.

"Saturn has a hexagon at the north pole," said Bolton. "There is nothing on Jupiter that anywhere near resembles that. The largest planet in our solar system is truly unique. We have 36 more flybys to study just how unique it really is."

Along with JunoCam snapping pictures during the flyby, all eight of Juno's science instruments were energized and collecting data. The Jovian Infrared Auroral Mapper (JIRAM), supplied by the Italian Space Agency, acquired some remarkable images of Jupiter at its north and south polar regions in infrared wavelengths.

"JIRAM is getting under Jupiter's skin, giving us our first infrared close-ups of the planet," said Alberto Adriani, JIRAM co-investigator from Istituto di Astrofisica e Planetologia Spaziali, Rome. "These first infrared views of Jupiter's north and south poles are revealing warm and hot spots that have never been seen before. And while we knew that the first ever infrared views of Jupiter's south pole could reveal the planet's southern aurora, we were amazed to see it for the first time. No other instruments, both from Earth or space, have been able to see the southern aurora. Now, with JIRAM, we see that it appears to be very bright and well structured. The high level of detail in the images will tell us more about the aurora's morphology and dynamics."

Among the more unique data sets collected by Juno during its first scientific sweep by Jupiter was that acquired by the mission's Radio/Plasma Wave Experiment (Waves), which recorded ghostly-sounding transmissions emanating from above the planet. These radio emissions from Jupiter have been known about since the 1950s but had never been analyzed from such a close vantage point.

"Jupiter is talking to us in a way only gas-giant worlds can," said Bill Kurth, co-investigator for the Waves instrument from the University of Iowa, Iowa City. "Waves detected the signature emissions of the energetic particles that generate the massive auroras which encircle Jupiter's north pole. These emissions are the strongest in the solar system. Now we are going to try to figure out where the electrons come from that are generating them."

The Juno spacecraft launched on Aug. 5, 2011, from Cape Canaveral, Florida and arrived at Jupiter on July 4, 2016. JPL manages the Juno mission for the principal investigator, Scott Bolton, of Southwest Research Institute in San Antonio. Juno is part of NASA's New Frontiers Program, which is managed at NASA's Marshall Space Flight Center in Huntsville, Alabama, for NASA's Science Mission Directorate. Lockheed Martin Space Systems, Denver, built the spacecraft. Caltech in Pasadena, California, manages JPL for NASA.

More information on the Juno mission is available at these sites:

<http://www.nasa.gov/juno>  
<http://missionjuno.org>



**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

\*SFAA is a 501(c)(3) nonprofit organization. Membership dues are tax-deductible as allowed by law.

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.