

# ★ ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

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# 01. SFAA PRESIDENT'S NOTE | FEBRUARY SKIES

February has brought us unseasonably warm days and clear, cool nights. And it appears to continue for the next week. Over that same period, Venus and Mercury have been visible at sunset, and continue to put on a show. I hope you have been able to take advantage of the great weather we have had as of late.

The SFAA board met earlier this month, and we have made some progress on the agenda we set out for the year. We are working with Friends of Mount Tam to help them get approval of their dates for public star parties on the mountain., and soon we will have dates for City star parties for at least the first few months of the year. I have reached out to two SFUSD high school science teachers about having a star party with their students, and getting the ball rolling with reaching out to administrators to see what is possible. I hope to get in contact with science teachers and administrators at middle schools and elementary schools as well.

All in all, it's a great start for the year, and we continue full steam ahead.

Clear skies,  
**P.J. Cabrera**  
President, SFAA

## SFAA BOARD OFFICERS AND DIRECTORS

<b>President</b>	PJ Cabrera	<a href="mailto:president@sfaa-astronomy.org">president@sfaa-astronomy.org</a>
<b>Vice President</b>	Jessica Miller	<a href="mailto:vice-president@sfaa-astronomy.org">vice-president@sfaa-astronomy.org</a>
<b>Treasurer</b>	Jim Burke	<a href="mailto:treasurer@sfaa-astronomy.org">treasurer@sfaa-astronomy.org</a>
<b>Secretary</b>	Bill Kircher	<a href="mailto:secretary@sfaa-astronomy.org">secretary@sfaa-astronomy.org</a>
<b>Directors</b>	Vanessa Anderson, Evan Ryder, Michael Wingerath, Ben Max Rubinstein, Liz Triggs, Douglas Smith, Thomas Perfumo	

### \* \* \* Note: SFAA Membership Process \* \* \*

Current SFAA members can create a login account to the SFAA website to edit personal profile information, view membership status, and renew membership. Members will need the email address that was used to join SFAA as the login username, and members will need to create a password the first time they login.

An auto-renewal process is also available to make annual renewals easier and effortless.

The process to join SFAA will also change slightly with new members prompted for their personal profile information in addition to payment details.

## 02. SFAA & BAY AREA ASTRONOMY EVENTS



**FEBRUARY 2020 – JUNE 2020**

Details: <http://www.sfaa-astronomy.org/events>

**Wednesday, February 19, 7:30 pm – 9:15 pm**  
Meeting and Lecture, [Randall Museum](#)

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**Saturday, February 22, 4:30 pm – 2:00 am**  
[Mt. Tam](#) Members Night (arrive BEFORE sunset)

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**Wednesday, March 18, 7:30 pm – 9:15 pm**  
Meeting and Lecture, [Randall Museum](#)

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**Saturday, March 21, 5:00 pm – 2:00 am**  
[Mt. Tam](#) Members Night (arrive BEFORE sunset)

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**Wednesday, April 15, 7:30 pm – 9:15 pm**  
Meeting and Lecture, [Randall Museum](#)

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**Saturday, April 25, 6:30 pm – 2:00 am**  
[Mt. Tam](#) Members Night (arrive BEFORE sunset)

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**Wednesday, May 20, 7:30 pm – 9:15 pm**  
Meeting and Lecture, [Randall Museum](#)

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**Saturday, May 23, 7:00 pm – 2:00 am**  
[Mt. Tam](#) Members Night (arrive BEFORE sunset)

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**Wednesday, June 17, 7:30 pm – 9:15 pm**  
Meeting and Lecture, [Randall Museum](#)

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**Saturday, June 20, 7:30 pm – 2:00 am**  
[Mt. Tam](#) Members Night (arrive BEFORE sunset)

### GET LIVE HELP WITH YOUR TELESCOPE!

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Are you a new telescope owner?

Or perhaps you could use some help with alignment, collimation, or other adjustments?

Like playing guitar or dancing the tango, learning to operate a telescope can, with great effort, be learned on your own.

However, it's much easier and more enjoyable to learn hands-on with experienced individuals.

Bring your telescope to a Star Party – we'll be happy to help!

### BAY AREA ASTRONOMY EVENTS

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Long-time SFAA member, Kenneth Lum, assembles and reports a list of Bay Area Astronomy events. Check the following link for information and additional events:  
<https://groups.yahoo.com/neo/groups/bayastro/info>

# 03. SFAA VOLUNTEER OPPORTUNITIES

## VOLUNTEER OPPORTUNITIES

Contact: SFAA Board ([volunteer@sfaa-astronomy.org](mailto:volunteer@sfaa-astronomy.org))

### Star Party Volunteers

- City Star Parties SFAA Board ([volunteer@sfaa-astronomy.org](mailto:volunteer@sfaa-astronomy.org))
- Mt. Tam Star Parties

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**Snack Volunteers** Linda Mahan ([speakerchair@sfaa-astronomy.org](mailto:speakerchair@sfaa-astronomy.org))

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**Marketing Volunteers** PJ Cabrera ([president@sfaa-astronomy.org](mailto:president@sfaa-astronomy.org))

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**Above the Fog Volunteers** PJ Cabrera ([president@sfaa-astronomy.org](mailto:president@sfaa-astronomy.org))

### Star Party Volunteers

SFAA hosts 2 to 3 star parties every month throughout the year, including City Star Parties in San Francisco and observation nights on Mount Tamalpais. We need **experienced SFAA members to serve as volunteers for these events**. If you've been to a few star parties, you're familiar with the procedures, and you're able to commit to attending these events, **we can use your help!**

Volunteers are responsible for: checking weather forecasts prior to scheduled events, coordinating with other volunteers, providing cancellation notice due to inclement weather or dangerous conditions (e.g. forest fires). Volunteers are expected to arrive to events early, welcome and orient members, and hold a brief huddle for all telescope operators to review procedures and answer questions.

For Mt. Tam events, volunteers are tasked with:

- members night: ensuring every vehicle belongs to an SFAA member and has a parking pass; at the end of the night, volunteers make sure members understand how to lock the gate on the way out; and
- public astronomy program: coordinating with Friends of Mt. Tam volunteers to manage visitor parking.

Volunteers receive an e-mail once a month to coordinate on upcoming star parties. If you're interested in volunteering, or if you have questions, please contact the SFAA board at [volunteer@sfaa-astronomy.org](mailto:volunteer@sfaa-astronomy.org).

### Snack Volunteers

SFAA needs volunteers to bring light refreshments to our monthly meetings and lectures at the Presidio Officers Club, on the **third Tuesday of each month**. Refreshments create a welcoming atmosphere for members and guests. Volunteers can donate snacks or provide receipts for expense reimbursement.

If you're interested in bringing refreshments, please send an e-mail to Linda Mahan at [speakerchair@sfaa-astronomy.org](mailto:speakerchair@sfaa-astronomy.org) and indicate which month(s) you can help with and what you'd like to bring.

### Marketing Volunteers

SFAA needs volunteers to help post SFAA event updates to groups such as SFGate, SF FunCheap, Eventful, Bay Area Science, etc. If you're interested in marketing opportunities, please send an e-mail to PJ Cabrera at [president@sfaa-astronomy.org](mailto:president@sfaa-astronomy.org).

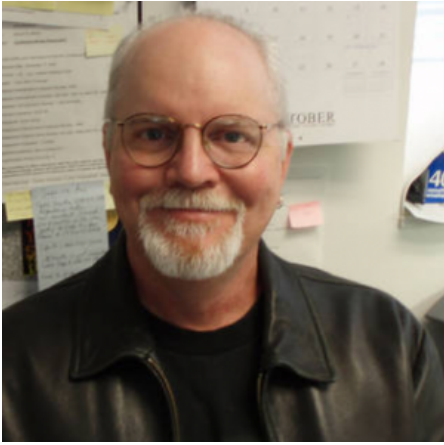
### Above the Fog Volunteers

SFAA distributes a monthly newsletter, *Above the Fog*. Volunteers are asked to submit an occasional article, astrophoto, and/or to serve as a member of the editorial team. If you're interested in contributing to these monthly newsletters, please send an e-mail to PJ Cabrera at [president@sfaa-astronomy.org](mailto:president@sfaa-astronomy.org).

**On behalf of the board of directors and your fellow SFAA members, thank you for your willingness to help out!**

## 04. SFAA LECTURE SERIES | FEBRUARY 19, 2020

### NASA'S PLUTO-KUIPER BELT MISSION AND THE ARROKOTH ENCOUNTER JEFF MOORE, PHD, NASA AMES



This presentation explores the historic voyage of the New Horizons spacecraft. After 10 years and more than 3 billion miles, New Horizons has served as an ambassador to the planetary frontier and has shed light on new kinds of worlds and the outskirts of the solar system.

In this talk Dr. Moore will discuss New Horizon's flight above the surface of Pluto and its encounter with the cold classical Kuiper Belt object (KBO) Arrokoth and will explain how this encounter has provided a look back into the beginning of our solar system, to a place where we can observe the most primordial building blocks of our world and the worlds around us.

As a Co-Investigator, Jeff Moore is the imaging node leader for the New Horizons mission. This activity involves working with the imaging team to define the science observations, plan the observational sequences, and calibrate the camera system. He also served as Chairman of the Jupiter Encounter Sequencing Team for the New Horizons mission, which enjoyed a very successful encounter with the giant planet and its moons in 2007.

As a Research Scientist at NASA Ames Research Center, Jeff's research has focused on a range of topics relating to the geologic evolution of planetary landscapes and crustal materials. He has published a number of papers on the geomorphology, stratigraphy, and sedimentology of, as well as explored the roles of impact cratering, volcanology, and tectonism on terrestrial planets and outer planet satellites. He is currently investigating the fluvially-dominated evolution of Titan's surface, the exogenic-processes-dominated nature of Titan's landforms, and the sublimation-driven erosion of the surfaces of Callisto and Hyperion. Along with his role as imaging node leader, Jeff is also PI for a number of Research Opportunities in Space and Earth Sciences (ROSES) awards: Mars Data Analysis Program (MDAP), Cassini Data Analysis program (CDAP), and Outer Planets Research Program (OPRP).

Jeff's extensive space mission experience includes, the Mars Exploration Rover (MER) as Science Team member/Long Term Planning Lead, the Mars Reconnaissance Orbiter as HiRISE Science Team collaborator, the Galileo Mission as Solid State Imaging Team Associate, and the Mars Polar Lander as a Participating Scientist.

Jeff's diverse background, which led him to his current position in Space Science started with a B.A. in History from the University of Oklahoma. From here he earned his B.S. in General Geophysics and then his M.S. and Ph.D. in Geology from Arizona State University. His first career was with the United States Army as a Lieutenant, Tank Platoon Leader, and Battalion Staff Officer. His professional experience as a researcher started early on at the School of Geology and Geophysics at the University of Oklahoma and OU's National Severe Storms Laboratory, and then the Department of Geology at Arizona State University, which brought him to the SETI Institute, and finally NASA ARC at Moffett Field, California.

#### **Randall Museum**

199 Museum Way, San Francisco, CA 94114

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

**SFAA'S GENERAL MEETINGS OCCUR ON THE 3<sup>RD</sup> WEDNESDAY OF EACH MONTH**

## 05. UPCOMING SFAA LECTURES 2020

MARCH 18<sup>TH</sup> | SIMON BIRRER

### Probing Fundamental Physics with Strong Gravitational Lensing

In general relativity, the presence of matter can curve spacetime, and the path of a light ray will be deflected as a result. This process is called gravitational lensing, analogous to the deflection of light by (e.g. glass) lenses in optics. In rare and extreme cases, light can take different paths to the observer and more than one image of the source will appear. Strong gravitational lensing is lensing that is strong enough to produce these multiple images, arcs, or even Einstein rings. Many useful results for cosmology have come out of using this phenomena. Dr. Birrer will shed more light on how astronomers are utilizing strong gravitational lensing to probe the nature of dark matter and dark energy, the dominant but yet unknown components of our Universe.

Simon Birrer received his degrees in Physics from the Swiss Federal Institute of Technology, Zurich, culminating in his PhD in 2016. He is a Postdoctoral Fellow at Stanford University since Fall of 2019. Before joining Stanford he was a postdoc researcher at UCLA, Department of Physics and Astronomy. Throughout his career, he enjoys interacting with the public giving lectures, telescope tours and planetarium shows. He hopes to engage and promote the talents and curiosity of the next generation of physicists.

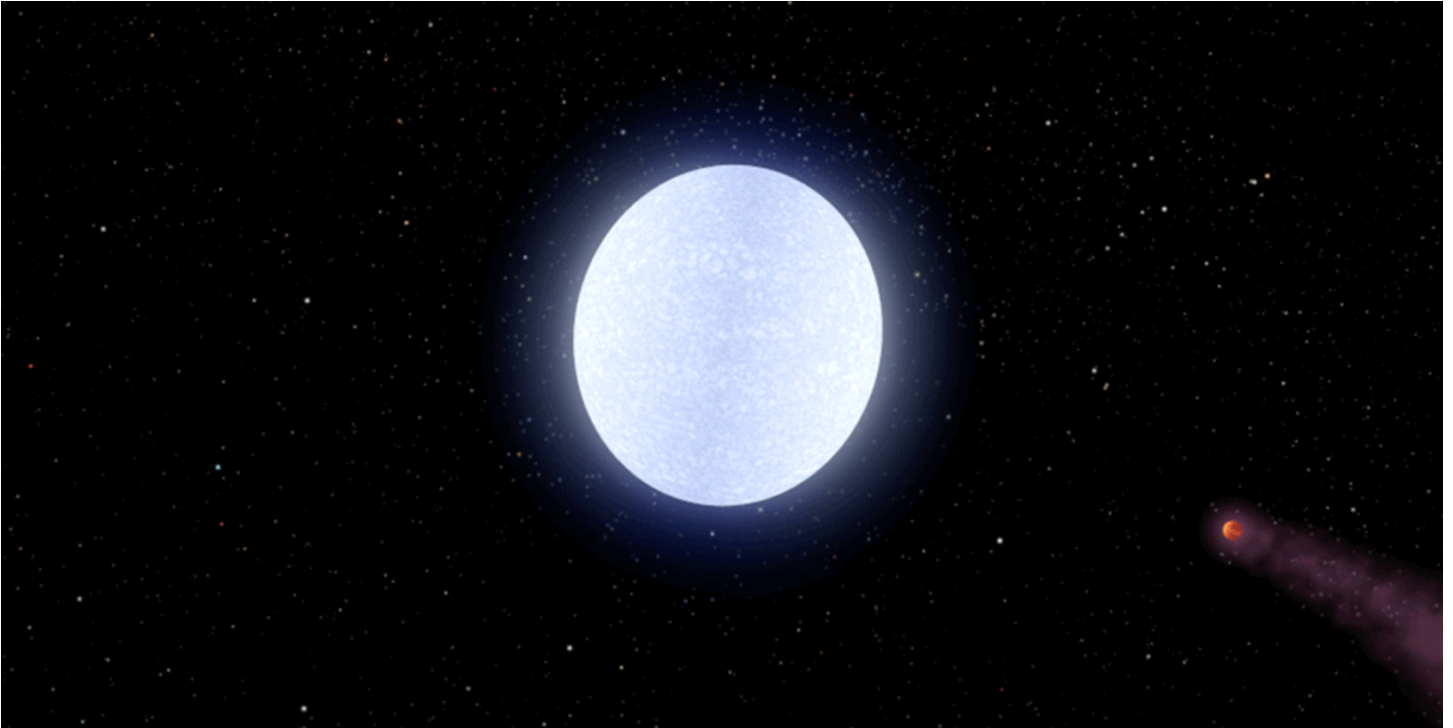
### Randall Museum

199 Museum Way, San Francisco, CA 94114

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

**SFAA'S GENERAL MEETINGS OCCUR ON THE 3<sup>RD</sup> WEDNESDAY OF EACH MONTH**

## For Hottest Planet, a Major Meltdown, Study Shows



*Artist's rendering of a "hot Jupiter" called KELT-9b, the hottest known exoplanet - so hot, a new paper finds, that even molecules in its atmosphere are torn to shreds.*

Credit: NASA/JPL-Caltech

In the scorching atmosphere of exoplanet KELT-9b, even molecules are torn to shreds.

Massive gas giants called "hot Jupiters" - planets that orbit too close to their stars to sustain life - are some of the strangest worlds found beyond our solar system. New observations show that the hottest of them all is stranger still, prone to planetwide meltdowns so severe they tear apart the molecules that make up its atmosphere.

Called KELT-9b, the planet is an ultra-hot Jupiter, one of several varieties of exoplanets - planets around other stars - found in our galaxy. It weighs in at nearly three times the mass of our own Jupiter and orbits a star some 670 light-years away. With a surface temperature of 7,800 degrees Fahrenheit (4,300 degrees Celsius) - hotter than some stars - this planet is the hottest found so far.

Now, a team of astronomers using NASA's Spitzer space telescope has found evidence that the heat is too much even for molecules to remain intact. Molecules of hydrogen gas are likely ripped apart on the dayside of KELT-9b, unable to re-form until their disjointed atoms flow around to the planet's nightside.

Though still extremely hot, the nightside's slight cooling is enough to allow hydrogen gas molecules to reform - that is, until they flow back to the dayside, where they're torn apart all over again.

"This kind of planet is so extreme in temperature, it is a bit separate from a lot of other exoplanets," said Megan Mansfield, a graduate student at the University of Chicago and lead author of a new paper revealing



these findings. "There are some other hot Jupiters and ultra-hot Jupiters that are not quite as hot but still warm enough that this effect should be taking place."

The findings, published in *Astrophysical Journal Letters*, showcase the rising sophistication of the technology and analysis needed to probe these very distant worlds. Science is just beginning to peer into the atmospheres of exoplanets, examining the molecular meltdowns of the hottest and brightest.

KELT-9b will stay firmly categorized among the uninhabitable worlds. Astronomers became aware of its extremely hostile environment in 2017, when it was first detected using the Kilodegree Extremely Little Telescope (KELT) system - a combined effort involving observations from two robotic telescopes, one in southern Arizona and one in South Africa.

In the *Astrophysical Journal Letters* study, the science team used the Spitzer space telescope to parse temperature profiles from this infernal giant. Spitzer, which makes observations in infrared light, can measure subtle variations in heat. Repeated over many hours, these observations allow Spitzer to capture changes in the atmosphere as the planet presents itself in phases while orbiting the star. Different halves of the planet roll into view as it orbits around its star.

That allowed the team to catch a glimpse of the difference between KELT-9b's dayside and its "night." In this case, the planet orbits its star so tightly that a "year" - once around the star - takes only 1 1/2 days. That means the planet is tidally locked, presenting one face to its star for all time (as our Moon presents only one face to Earth). On the far side of KELT-9b, nighttime lasts forever.

But gases and heat flow from one side to the other. A big question for researchers trying to understand exoplanet atmospheres is how radiation and flow balance each other out.

Computer models are major tools in such investigations, showing how these atmospheres are likely to behave in different temperatures. The best fit for the data from KELT-9b was a model that included hydrogen molecules being torn apart and reassembled, a process known as dissociation and recombination.

"If you don't account for hydrogen dissociation, you get really fast winds of [37 miles or] 60 kilometers per second," Mansfield said. "That's probably not likely."

KELT-9b turns out not to have huge temperature differences between its day- and nightsides, suggesting heat flow from one to the other. And the "hot spot" on the dayside, which is supposed to be directly under this planet's star, was shifted away from its expected position. Scientists don't know why - yet another mystery to be solved on this strange, hot planet.

## **News Media Contact**

Calla Cofield  
Jet Propulsion Laboratory, Pasadena, Calif.  
626-808-2469  
[calla.e.cofield@jpl.nasa.gov](mailto:calla.e.cofield@jpl.nasa.gov)

Written by Pat Brennan





### Application for New or Renewing Membership

1. Memberships, with dues payment, are for one year running from the member's join or renewal date.
2. New or renewal memberships sent in via USPS mail will have membership start date based on postmark date.
3. SFAA is a 501(c)(3) nonprofit organization. Membership dues are tax-deductible, as allowed by law.

**This application is for:**

- New**  
 **Renewing**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

E-mail: \_\_\_\_\_

Phone  
(optional): \_\_\_\_\_

- Membership Type:**     Individual - \$30.00     Family - \$35.00     Student - \$10.00  
 Supporting - \$80.00     Institutional - \$40.00

**(All dues tax-deductible as allowed by law)**

- Please mail me a Mount Tamalpais Parking Permit (1 per membership)**

**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**

Both new and renewing members will receive a verifying email from the SFAA upon completion of the membership process.