

# ★ ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

Vol. 61, No. 7 - July 2013

## **GENERAL MEETING – AUGUST 28, 2013**

*Randall Museum . 199 Museum Way . San Francisco*

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

*SFAA's General Meetings occur on the 3<sup>rd</sup> Wednesday of each month (except January)*

### **THE SECRET LIFE OF A METEORITE DEREK SEARS, SPACE SCIENCE AND ASTROBIOLOGY DIVISION, NASA AMES RESEARCH CENTER**



It is clear that the chondritic meteorites - those having essentially solar composition - carry unique information about the origin and early history of the solar system and the materials from which the planets formed. Yet it is a highly complex record that centuries of work and highly sophisticated modern techniques have not been able to decipher. Even the most fundamental issues, the origin of the classes and the origin of their major component, the chondrules (that distinguish the meteorites from other materials), are still disputed. Here I argue that recent data from spacecraft on the nature of asteroid surfaces, advances in determining the chronology meteorites and their components, experiments flown on NASA's microgravity facility (the vomit comet), and the lunar samples returned from the Fra Mauro region of the Moon, make it clear that chondrules are impact melt spherules and the classes are caused by metal-silicate fractionation on asteroidal surfaces. In other words, the chondritic meteorites owe their major properties to asteroidal processes and that we must see through these to understand the information they carry about the early solar system and beyond.

Dr. Sears is a research scientist at NASA Ames Research Center. Until summer 2011, he was University Professor and W. M. Keck Professor at the University of Arkansas. His research interests involve laboratory studies of extraterrestrial materials, especially meteorites and lunar samples, mostly using thermoluminescence and cathodoluminescence. In the past he has performed instrumental neutron activation analysis and electron microprobe analysis. He has also worked on the surface processes occurring on Mars, asteroids and comets and has developed techniques to investigate these processes using microgravity and space simulation experiments. He has published three books and about 200 peer-reviewed research articles. Other interests include the history of meteoritics and planetary science and educational outreach, and he is the current editor of Meteorite magazine.

## **AUGUST MEETING – CHANGE OF DATE TO AUGUST 28**

*Due to a calendar conflict at the Randall,  
San Francisco Amateur Astronomers August General Meeting  
has been rescheduled to Wednesday, August 28  
Doors open 7:00 p.m., 7:30 p.m. Announcements, 8:00 p.m. Speaker*

## **PRESIDENT'S MESSAGE**

Greetings SFAA'ers,

Happy Equatorial New Year! Equatorial New Year is my own personal made-up holiday which celebrates 0 hours right ascension (RA) crossing the meridian during evening observing. I started noting 0h crossing the sky during Fall evenings years ago, using my wide star chart that spans all 24h of the celestial sphere. During September I'd have to move from the far left side of the chart around 20h-23h to the far right, around 0h-3h, which made star hopping a bit more cumbersome for that month.

As it turns out that split in the coordinate system at 0h coincides with the vernal equinox, and therefore the first day of Fall is like Equatorial New Year since that's when 0h will transit at midnight standard time. Rather than be annoyed by that split in the chart running straight through Pegasus, Pisces, and Sculptor, I figure why not celebrate it as another year of observing passed?

On club related matters, our board and other club volunteers have been working behind the scenes on projects like researching and trying out A/V equipment for our lectures and outreach star tours, researching blinky red lights for telescopes during star parties, and planning our member social for September 7th. We also did a member survey and the results are being compiled. About 20% of our members responded to the survey, which we consider pretty good. Thanks to those of you who took time to fill it out and submit it to us.

As the evenings get longer, the fog in San Francisco starts clearing, and we head into Fall and Equatorial New Year, I wish you a fun season enjoying amateur astronomy.

**ANGIE TRAEGER**  
**President**  
**San Francisco Amateur Astronomers**  
**2013**

# REQUESTS FROM RANGER RYEN FOR OUR MT. TAM OBSERVING NIGHTS

Greetings Mt. Tam observers! During a meeting with Ranger Ryen and Tinka Ross, Ranger Ryen passed along a few requests for our membership. One of them was completely news to me (Item #2 below), but after his explanation it makes perfect sense.

**1. Display your parking placard BEFORE the rangers stop by to inspect our dashboards.** The rangers are supposed to issue citations if we don't display a parking pass, and when they chase us down to ask for the passes they are only trying to be friendly and do us a favor. If you happen to forget to display your pass and the ranger asks you to display it, do so quickly. Stop your conversation, equipment setup, etc. and head to your car to get your parking pass.

To assist the rangers in speeding up their checks, you may find board members walking around during our members-only nights to remind folks to display passes. We'll also check for passes at the orange cone line during the Public Nights. (If you need to get your pass updated see the instructions on this page: <http://www.sfaa-astronomy.org/membership/>)

**2. Please don't drive around the half closed Pantoll Gate, where the exit is open and the entrance is closed.** (Yep, this is news to me -- Doug and I used to drive through the exit all of the time!) While the gate is half closed, the rangers are in the process of closing the park. Driving around the gate technically is a violation of some sort and the rangers protocol is to perform a "traffic stop" on anyone doing so. This takes up the rangers' time and is unnecessary.

If you encounter the gate half closed, wait at the bottom of the hill until the ranger comes back to close and fully lock up the gate. You can then show your parking pass and enter. Best practice is to arrive at Rock Springs before sunset.

**3. For the Mt. Tam Public Nights, it is helpful to put small dim red led markers or glowy tape on the base of telescopes,** especially on tripod legs. Both Ranger Ryen and Tinka report that the public is sometimes nervous about approaching a telescope because they can't see where the telescope is. When looking at the ground there is no sky to silhouette the equipment, like there is for navigating around people or an eyepiece at night time. Placing little markers on the legs or bottoms of the scope helps the public avoid having to use bright red lights in order to get around.

Some helpful advice can be found on this page from the SF Sidewalk Astronomers: <http://www.sfsidewalkastronomers.org/index.php?page=organizing-a-public-star-party>, particularly a link to the glow-in-the-dark-tape. [http://www.scopestuff.com/ss\\_glot.htm](http://www.scopestuff.com/ss_glot.htm).

Board members are currently researching glowing marker products that the club could potentially provide and/or sell in small quantities to club members.

**4. For the Mt. Tam Public Nights, Ranger Ryen and Tinka thought it would be very nice if we could wear glowing name badges or a glowing club logo pin of some sort,** so that the public knows who the "owner" of a scope is. Sometimes as the telescope owner we stand amongst members of the public, and it makes it easier for the public to ask us a question if we stand out from the crowd.

Board members are researching glowing badges -- we want to make something available that is not *too* bright. Stay tuned for an evening demo of badge samples in July or August.

Thanks all!

# IMPORTANT DATES & UPCOMING SFAA VIEWING EVENTS

## SFAA GENERAL MEETINGS & LECTURES

*Randall Museum, 199 Museum Way (Near 14<sup>th</sup> Street and Roosevelt)*

*Third Wednesday of each month: 7:00 p.m. Doors open. 7:30 p.m. Announcements. 8:00 p.m. Speaker*

**SFAA BOARD MEETINGS IMMEDIATELY PRECEDE GENERAL MEETINGS AND BEGIN AT 6:00 P.M.**

August 28, September 18, October 16, November 20, December 18

## **AUGUST MEETING – CHANGE OF DATE TO AUGUST 28**

*Please note that due to a calendar conflict at the Randall,  
San Francisco Amateur Astronomers August General Meeting has been*

**RESCHEDULED to WEDNESDAY, AUGUST 28**

*Doors open 7:00 p.m., 7:30 p.m. Announcements, 8:00 p.m. Speaker*

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## CITY STAR PARTY

[http://www.sfaa-astronomy.org/star\\_parties/city/](http://www.sfaa-astronomy.org/star_parties/city/)

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## 2010 MT TAM SPECIAL USE PERMIT STAR PARTIES MEMBERS ONLY

**SPECIAL USE PERMIT** observing nights on Mount Tamalpais are private, open *only* to SFAA members. Please arrive by sunset. SFAA/Mt. Tam permit required for each car. We must vacate the mountain by 2:00 a.m. except on specially approved nights (such as Messier Marathon).

## ALWAYS ON A SATURDAY

August 31, October 5, November 2, November 30

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## MT TAM PUBLIC STAR PARTIES (April through October)

Public nights on Mount Tamalpais start with a lecture in the Mountain Theatre followed by public viewing in the Rock Springs parking lot.

SFAA members may view privately after crowd departs from approx. 11 pm-2 am.

For more information: <http://www.sfaa-astronomy.org/starparties/>

Aug 10, Sept 7 and Oct 12

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# UPCOMING LECTURES

## September 18 - **BROWN DWARFS: THE SPECTROSCOPY OF SUBSTELLAR OBJECTS** **GIBOR BASRI**



The most massive planet is nearly 6 times lighter than the least massive star. In between is the realm of brown dwarfs. In 1995 both the first brown dwarf and the first exoplanet were discovered. Since then we have found hundreds of each, and have learned quite a bit. Recent infrared surveys have now probed the whole sky to very faint levels. Recent discoveries include the coolest and closest brown dwarfs. This allows us to push to very cool objects - the spectral sequence has added 3 to the original 7: L, T, and Y dwarfs. We can actually see brown dwarfs, whereas exoplanets are almost all detected only indirectly. Brown dwarfs overlap in temperature with young massive exoplanets, so their spectra look much more like planets than stars. I will give a flavor of how spectroscopy can be used to study what the atmospheres and physical properties of such objects are like.

Gibor Basri has been a professor of Astronomy at UC Berkeley for more than 30 years. He is known as one of the discoverers of brown dwarfs, and an expert on low mass stars. In addition, he has contributed significantly to our understanding of star formation, and is now a member of the Kepler mission team which is searching for earth-sized exoplanets. Professor Basri has employed telescopes ranging from nearby Lick Observatory to the mighty Keck telescopes on Mauna Kea to space-borne telescopes like Hubble and Kepler. He has been awarded a Miller Research Professorship, and Sigma Xi Distinguished Lectureship. Basri has

over 200 publications and 10,000 citations to his work, has given many public lectures and appeared on several television programs. He has long made promotion of science in underrepresented communities a mission, and is now the Vice Chancellor for Equity and Inclusion at Berkeley.

From Kenneth Frank --  
**JOHN DOBSON WILL TURN 98! IN SEPTEMBER**  
It's ever too soon to plan --



**JOHN DOBSON'S 98th BIRTHDAY CELEBRATION**

We will be celebrating John's 98th birthday with a day-long event on  
Wednesday, September 18  
at  
Griffith Observatory  
Los Angeles

In true sidewalk fashion, we'll be building a 12" telescope to use for observing the Moon that evening as part of the International Observe the Moon celebration.

There will be hands-on grinding for the public and any amateurs who want to get a work out. We'll also be assembling the mount so that everyone can see the entire telescope building process for themselves.

More info to come as we do the details. Maybe we can caravan down to LA.  
If you cannot go and would like to give him a card of good wishes, just mail it to me:

773 Tiburon Blvd.  
Tiburon, CA  
94920

or post on facebook:  
<http://www.facebook.com/Sidewalkastro?fref=ts>

As John would say:

"Over & Out"

## NIGHT SKY NETWORK

### August 2013 - THE EVENING SKY

August Sky Map: <http://skymaps.com/skymaps/tesmnl308.pdf>

August Sky Calendar: <http://skymaps.com/articles/nl308.html>

## 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

<p>EVERY FRIDAY NIGHT 7:00 PM – 10:00 PM excluding major holidays</p> <p>The Telescope Makers' Workshop</p> <p>CHABOT SPACE AND SCIENCE CENTER 10000 Skyline Boulevard Oakland, CA 94619-2450</p>	<p><b>THE TELESCOPE MAKERS' WORKSHOP</b> 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 &amp; Science Center, 10000 Skyline Blvd., Oakland. Contact us for more specific details:</p> <p>Contact: E-mail Richard Ozer (<a href="mailto:rozer@pacbell.net">rozer@pacbell.net</a>) or (510) 406-1914</p>
<p>EVERY FRIDAY &amp; 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><b>EXPLORE THE NIGHT SKIES AT THE CHABOT OBSERVATORIES</b> For more information: <a href="http://www.chabotspace.org/">http://www.chabotspace.org/</a></p> <p><b>Free Telescope Viewing</b> Regular hours are every Friday &amp; 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><b>Daytime Telescope Viewing</b> 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><b>STAR PARTIES AT CRESTVIEW PARK, SAN CARLOS</b></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 has 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 <a href="mailto:SMCAS@live.com">SMCAS@live.com</a> or call Ed Pieret at (650)862-9602.</p> <p><b>Reasons to Attend</b></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. 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><b>EVERY CLEAR FRIDAY EVENING</b>  <b>9:00 PM – 11:00 PM</b></p> <p><b>FOOTHILL COMMUNITY COLLEGE OBSERVATORY</b>  <b>12345 Moody Road</b>  <b>Los Altos Hills</b></p> <p><b>Cost: Free</b></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>
<p><b>EVERY CLEAR SATURDAY MORNING OBSERVATORY</b>  <b>10:00 AM – 12:00 PM</b></p> <p><b>FOOTHILL COMMUNITY COLLEGE</b>  <b>12345 Moody Road</b>  <b>Los Altos Hills</b></p> <p><b>Cost: Free</b></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>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>



**BAY AREA EVENTS – AUGUST 2013**

**Tuesday, August 27  
7:00 PM NOTE LATER TIME**

**SETI INSTITUTE  
189 Bernardo Ave  
Mountain View, CA 94043**

**SPEAKER: FRANCK MARCHIS, SETI INSTITUTE  
SETI COLLOQUIUM SERIES: BREAKING THE SEEING BARRIER FOR PLANETARY ASTRONOMY**

When Galileo Galilei pointed his telescope toward Jupiter in 1609 and discovered what we now call the Galilean moons, he did not realize that he had just established a new research field in astronomy. In the past four centuries, planetary astronomy, the study of our solar system bodies using telescopes, has increased our knowledge of the environment of Earth, the evolution of the planets, the origin of comets and asteroids and the formation of our solar system. Space exploration accelerated planetary astronomy in the 1960s by allowing planetary scientists to access in-situ and detailed data. In this talk, I will discuss the contributions of telescopic observation over the past 50 years to planetary science, particularly the recent developments like adaptive optics which renewed interest in ground-based observations of planets. I will explore the contribution of all-sky surveys like Pan-STARRS and LSST, which provide several terabytes of data a week, changing radically the way we do astronomy. Looking to the future of space-based astronomy, I will consider whether the James Webb Space Telescope and ATLAST are potential successors to the successful Hubble Space Telescope. Finally I'll explore the way in which specialized low-cost telescopes designed to search and study exoplanets, planets around other stars, constitutes a paradigm shift in our field.

<http://plus.google.com/events/c6muvec6gait4fb1rfvoq212eo4>

**Wednesday, August 28  
8:00 PM**

**THE CREPE PLACE  
1134 Soquel Avenue  
Santa Cruz CA 95062**

**Cost: Free**

**SPEAKER: DR. NIC BRUMMEL (APPLIED MATHEMATICS AND STATISTICS)  
THE MATHEMATICS OF THE SUN**

Since our nearest and dearest star, the Sun, is the source of all life on our planet, it would be nice to know a little about it. Despite the fact that we can look at the Sun in amazing detail these days, we still understand very little about how it works in any detail. For example, out of the general chaos emerges the shockingly ordered and structured cycle of magnetic activity – or 'the sunspot cycle' as it is often popularly known. Basic mathematics has provided some great intuition as to how this might possibly be, but, as we test these theories using larger and larger supercomputers and therefore more and more realistic simulations, we find that our intuitive ideas often fail. This is great for job security but frustrating scientifically. Where do we go from here? Is it all doom and gloom? Will we conquer this problem? What about the dynamics of similar stars?

**Friday, August 30  
8:45 – 11:45 PM**

**SAN JOSE ASTRONOMICAL  
ASSOCIATION  
Houge Park  
Twilight Drive  
San Jose, CA 95124**

**Cost: Free**

**HOUGE PARK STAR PARTY**

Saturday, August 31  
7:30 – 8:15 PM

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

**SPEAKER: FARIDE KHALAF**  
**STAYING ALIVE: THE SOKOL SPACESUIT**

Come learn the brief history of spacesuits from the earliest pressure suits worn by aviators in the 1930s to the state of the art used on the International Space Station. You'll get a chance to see an actual Russian Sokol Spacesuit with a demonstration of its features and its use. Made in great numbers since 1973, Sokol is the most commonly used spacesuit and is described as a rescue suit, not capable of being used outside the spacecraft in a spacewalk or extra-vehicular activity. The Sokol spacesuit (Russian: СКОЛ, Falcon) is a type of Russian space suit worn by all who fly on the Soyuz spacecraft.

Website: <http://www.chabotspace.org/space-talks.htm>

### NASA SCIENCE CAST

The Science@NASA team is pleased to announce a new product: the ScienceCast. Every week, we produce a short video highlighting a topic in NASA science news. A complete list of ScienceCast episodes may be found on Science@NASA's Youtube channel: <http://www.youtube.com/user/ScienceAtNASA> . Enjoy!

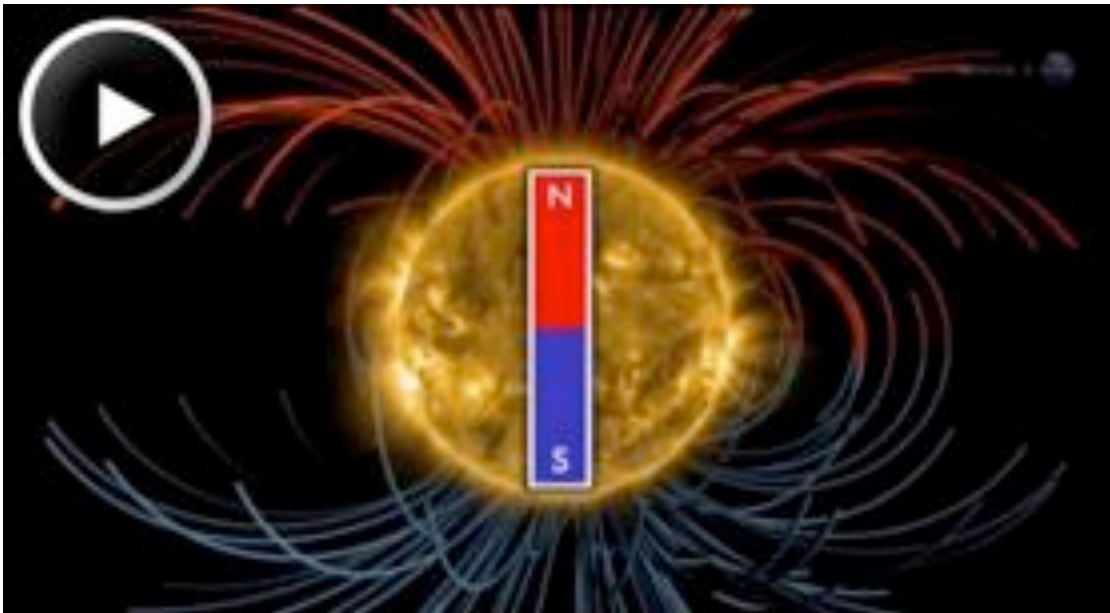
### NASA SCIENCE NEWS

<http://science.nasa.gov/science-news/>

## THE SUN'S MAGNETIC FIELD IS ABOUT TO FLIP

**August 5, 2013:** Something big is about to happen on the sun. According to measurements from NASA-supported observatories, the sun's vast magnetic field is about to flip.

"It looks like we're no more than 3 to 4 months away from a complete field reversal," says solar physicist Todd Hoeksema of Stanford University. "This change will have ripple effects throughout the solar system."



A new ScienceCast video anticipates the reversal of the sun's global magnetic field. [Play it](#)

The sun's magnetic field changes polarity approximately every 11 years. It happens at the peak of each solar cycle as the sun's inner magnetic dynamo re-organizes itself. The coming reversal will mark the midpoint of Solar Cycle 24. Half of 'Solar Max' will be behind us, with half yet to come.

Hoeksema is the director of Stanford's Wilcox Solar Observatory, one of the few observatories in the world that monitor the sun's polar magnetic fields. The poles are a herald of change. Just as Earth scientists watch our planet's polar regions for signs of climate change, solar physicists do the same thing for the sun. Magnetograms at Wilcox have been tracking the sun's polar magnetism since 1976, and they have recorded three grand reversals—with a fourth in the offing.



Astronomers at the Wilcox Solar Observatory (WSO) monitor the sun's global magnetic field on a daily basis. [WSO home page](#)

Solar physicist Phil Scherrer, also at Stanford, describes what happens: "The sun's polar magnetic fields weaken, go to zero, and then emerge again with the opposite polarity. This is a regular part of the solar cycle."

A reversal of the sun's magnetic field is, literally, a big event. The domain of the sun's magnetic influence (also known as the "heliosphere") extends billions of kilometers beyond Pluto. Changes to the field's polarity ripple all the way out to the Voyager probes, on the doorstep of interstellar space.

When solar physicists talk about solar field reversals, their conversation often centers on the "current sheet." The current sheet is a sprawling surface jutting outward from the sun's equator where the sun's slowly-rotating magnetic field induces an electrical current. The current itself is small, only one ten-billionth of an amp per square meter ( $0.0000000001$  amps/m<sup>2</sup>), but there's a lot of it: the amperage flows through a region 10,000 km thick and billions of kilometers wide. Electrically speaking, the entire heliosphere is organized around this enormous sheet.

During field reversals, the current sheet becomes very wavy. Scherrer likens the undulations to the seams on a baseball. As Earth orbits the sun, we dip in and out of the current sheet. Transitions from one side to another can stir up stormy space weather around our planet.



An artist's concept of the heliospheric current sheet, which becomes more wavy when the sun's magnetic field flips. [More](#)

Cosmic rays are also affected. These are high-energy particles accelerated to nearly light speed by supernova explosions and other violent events in the galaxy. Cosmic rays are a danger to astronauts and space probes, and some researchers say they might affect the cloudiness and climate of Earth. The current sheet acts as a barrier to cosmic rays, deflecting them as they attempt to penetrate the inner solar system. A wavy, crinkly sheet acts as a better shield against these energetic particles from deep space.

As the field reversal approaches, data from Wilcox show that the sun's two hemispheres are out of synch.

"The sun's north pole has already changed sign, while the south pole is racing to catch up," says Scherrer. "Soon, however, both poles will be reversed, and the second half of Solar Max will be underway."

When that happens, Hoeksema and Scherrer will share the news with their colleagues and the public.

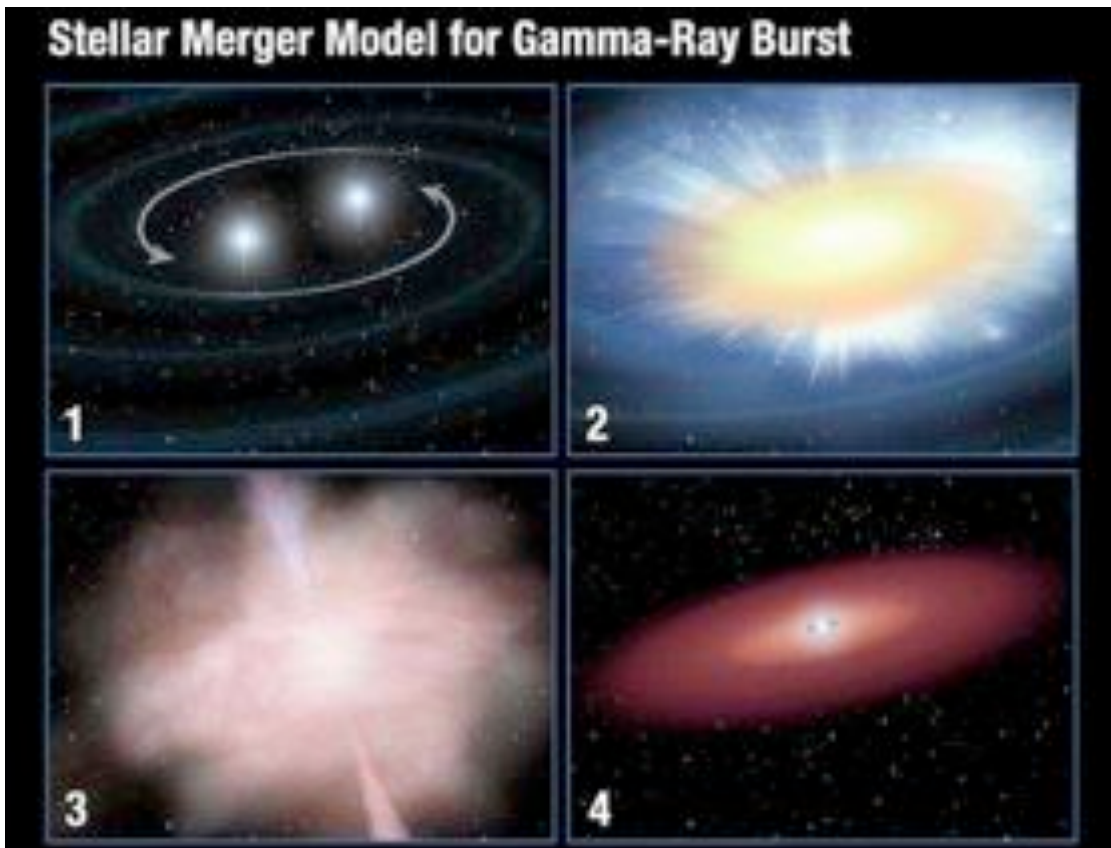
Stay tuned to Science@NASA for updates.

**Credits:** Author: [Dr. Tony Phillips](#) | Production editor: [Dr. Tony Phillips](#) | Credit: [Science@NASA](#)

**More information:** [Is Solar Max Double-Peaked?](#) -- ScienceCast video

## HUBBLE SEES THE FIREBALL FROM A "KILONOVA"

**August 3, 2013:** NASA's Hubble Space Telescope has detected a new kind of stellar blast called a kilonova, which happens when a pair of compact objects such as neutron stars crash together. Hubble observed the fading fireball from a kilonova last month, following a short gamma ray burst (GRB) in a galaxy almost 4 billion light-years from Earth.



"This observation finally solves the mystery of short gamma ray bursts," says Nial Tanvir of the University of Leicester in the United Kingdom, who led a team of researchers conducting this research.

This sequence illustrates the kilonova model for the formation of a short-duration gamma-ray burst. 1. A pair of neutron stars in a binary system spiral together. 2. In the final

milliseconds, as the two objects merge, they kick out highly radioactive material. This material heats up and expands, emitting a burst of light called a kilonova. 3. The fading fireball blocks visible light but radiates in infrared light. 4. A remnant disk of debris surrounds the merged object, which may have collapsed to form a black hole. [More](#)

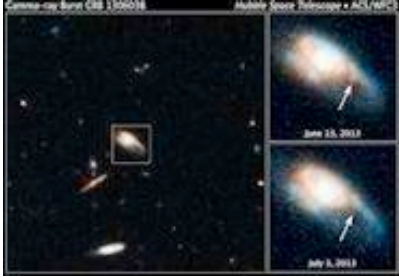
Gamma ray bursts are flashes of intense high-energy radiation that appear from random directions in space. They come in two flavors--long and short. "Many astronomers, including our group, have already provided a great deal of evidence that long-duration gamma ray bursts (those lasting more than two seconds) are produced by the collapse of extremely massive stars," explains Tanvir.

The short bursts, however, were more mysterious.

"We only had weak circumstantial evidence that short bursts [might be] produced by the merger of compact objects," he adds. "This result now appears to provide definitive proof."

Astrophysicists have predicted short-duration GRBs are created when a pair of super-dense neutron stars in a binary system spiral together. This event happens as the system emits gravitational radiation, creating tiny waves in the fabric of space-time. The energy dissipated by the waves causes the two stars to sweep closer together. In the final milliseconds before the explosion, the two stars merge into a death spiral that kicks out highly radioactive material. This material heats up and expands, emitting a burst of light.

The resulting "kilonova" is about 1,000 times brighter than a regular nova, which is caused by the eruption of a white dwarf.



These Hubble images show the fireball afterglow of Gamma-ray Burst 130603B. [More](#)

In a recent science paper Jennifer Barnes and Daniel Kasen of the University of California at Berkeley and the Lawrence Berkeley National Laboratory presented new calculations predicting how kilonovas should look. They predicted the same hot plasma producing the radiation also will block the visible light, causing the gusher of energy from the kilonova to flood out in near-infrared light over several days.

An unexpected opportunity to test this model came June 3 when NASA's Swift space telescope picked up the extremely bright gamma ray burst, cataloged as GRB 130603B. Although the initial blast of gamma rays lasted just one-tenth of a second, it was roughly 100 billion times brighter than the subsequent kilonova flash.

From June 12-13, Hubble searched the location of the initial burst, spotting a faint red object. An independent analysis of the data from another research team confirmed the detection. Subsequent Hubble observations on July 3 revealed the source had faded away, therefore providing the key evidence the infrared glow was from an explosion accompanying the merger of two objects.

The team's results appeared Aug. 3 in a special online publication of the journal Nature.

**Credits:** Production editor: [Dr. Tony Phillips](#) | Credit: [Science@NASA](#)

**More information:** For images and more information on the kilonova, visit: <http://hubblesite.org/news/2013/29>

For more information about the Hubble Space Telescope, visit: <http://www.nasa.gov/hubble>

## 2013 CLUB OFFICERS & CONTACTS

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1 <sup>st</sup> Alternate		
2 <sup>nd</sup> Alternate		
Webmaster	Matthew Jones	

## CLUB TELESCOPES

The SFAA owns eight very fine, easy to use, loaner telescopes well-suited for deep sky, planets, and star parties. All scopes are available to any SFAA member. The loaner custodians for the majority of our fleet are Pete & Sarah Goldie. Please contact them at [telescopes@sfaa-astronomy.org](mailto:telescopes@sfaa-astronomy.org) for details if you are interested in borrowing a scope or if you have items you can donate for the loaner program (eyepieces, star maps/books, red flashlights, collimator, etc.). Please contact the appropriate member indicated below if you are interested in borrowing one of the telescopes.

- 1) 6" f/10.3 Dobsonian/Ken Frank [ken@sfaa-astronomy.org](mailto:ken@sfaa-astronomy.org)
- 2) 8" f/7 Dobsonian/Pete Goldie
- 3) 8.5" f/6 Dobsonian/Pete Goldie
- 4) 10" f/8 Dobsonian/Pete Goldie
- 5) 114mm f/4 Newtonian StarBlast/Pete Goldie
- 6) 8" f/10 Celestron SCT/Annette Gabrielli/ [annette@sfaa-astronomy.org](mailto:annette@sfaa-astronomy.org)
- 7) 8" f/10 Meade SCT/Stefanie Ulrey/[treasurer@sfaa-astronomy.org](mailto:treasurer@sfaa-astronomy.org)
- 8) 9.5" f/5.6 Celestron Newtonian/Ken Frank/ [ken@sfaa-astronomy.org](mailto:ken@sfaa-astronomy.org)

## CLUB ASTRONOMY VIDEOS

The SFAA owns a series of astronomy videotapes featuring Alex Filippenko, a world-renowned professor of astronomy at UC Berkeley. The videotapes provide an introduction to astronomy and cover topics such as the Solar System, the lifecycles of stars, the nature of galaxies, and the birth of the Universe. The SFAA loans the tapes free to all members. If you are interested in viewing these tapes, you may check them out at any of the SFAA General Meetings. These tapes were kindly donated to the SFAA by Bert Katzung. For information on the course tapes themselves:

<http://www.teach12.com/ttc/assets/coursedescriptions/180.asp>

## MEMBERSHIP DUES

Membership is billed for each upcoming year on June 30. Members may receive no more than one bulletin after the expiration of membership.

## SFAA WEBSITE AND ONLINE SERVICES

The SFAA web site at [sfaa-astronomy.org](http://sfaa-astronomy.org) is provided to our members and the general public for the sharing of club information and services. The web site contains links for club [star parties](#), [events](#), [newsletters](#), [lectures](#) and [meetings](#). If you wish to interact with other people who are interested in astronomy, the SFAA web site offers public and members only [bulletin board forums](#). If you wish to remain up-to-date on club activities, then we encourage you to subscribe to one or both of our public [mailing lists](#), which will allow you to receive our newsletter and/or club announcements via email. Other useful and interesting information and services are available on the site such as [observing location reviews](#), member [astronomy photos](#), and [members only telescope loans](#). Information about SFAA's membership, organization and by-laws are available at the club's online public document [archive](#). If you need to contact a representative of the SFAA, then please visit our [contacts](#) page to help in finding the right person to answer your questions.

*Above the Fog* is the official bulletin of the San Francisco Amateur Astronomers. It is the forum in which club members may share their experiences, ideas, and observations. We encourage you to participate by submitting your articles, announcements, letters, photos and drawings. We would also like to hear from our new members. Tell us about yourself – what you have done in the past and what other clubs you have joined. **The deadline for the next issue is the 25th day of the month.** Send your articles to [Editor@sfaa-astronomy.org](mailto:Editor@sfaa-astronomy.org)

San Francisco Amateur Astronomers  
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San Francisco CA 94115

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### MEMBERSHIP APPLICATION

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*Sharing the Wonders of the Universe*

**Has your membership expired?** Your mailing label includes the month and year through which your membership is paid. If it is past, your membership has expired and this may be your last issue.