

# ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

Vol. 63, No. 3 – March 2015

## GENERAL MEETING

### NEW MEETING LOCATION

**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 3<sup>rd</sup> *TUESDAY* of each month (except January)**

Once monthly, the San Francisco Amateur Astronomers hosts distinguished guest speakers who are leaders in the fields of astronomy, physics, and related disciplines, to present the latest developments from cutting-edge scientific programs.

## MARY BARSONY, SETI INSTITUTE

### ***Brown Dwarfs, Planetary Mass Objects, and their Disks in the Nearest Star-Forming Regions***



Join Mary Barsony, of the SETI Institute, for a presentation on ***Brown Dwarfs, Planetary Mass Objects, and their Disks in the Nearest Star-Forming Regions.***

Objects with masses ( $<0.08$  solar masses) too small to sustain hydrogen fusion were theorized to exist five decades ago, and discovered 30 years later, due to their extreme faintness. Even less massive ( $<13$  Jupiter or  $<0.01$  solar masses) are the planetary mass objects (PMOs), so-called because they are not orbiting a star. We have discovered large populations of such free-floating PMOs and brown dwarfs in the nearest star-forming regions to Earth, when they are at their brightest

and most amenable to detection. Do such objects outnumber the stars in the Galaxy? Do they have their own planetary or moon systems? Could these sustain surface or subsurface liquid water for eons via tidal heating and thus provide environments conducive for the development of microbial life?

*Dr. Barsony is a Principal Investigator at the Carl Sagan Center for the Study of Life in the Universe at the SETI Institute and Adjunct Professor of Physics and Astronomy at San Francisco State University. She has served as a faculty member at USC, Harvey Mudd College, and U.C. Riverside. She earned her Ph.D. in physics from Caltech, and her S.B. in physics from MIT.*

*Through submillimeter observations in the early '90's, Dr. Barsony discovered the first true protostar—an object surrounded by infalling gas in the process of accumulating the mass it will have as a full-fledged star. Protostars are the focus of intense study with state-of-the-art instruments, on the Keck telescopes in Hawaii, the future JWST (James Webb Space Telescope) scheduled for a 2018 launch, and ALMA (the Atacama Large Millimeter/Submillimeter Array)—consisting of a total of 66 radio telescopes operating as one at 16000 ft. elevation in the driest desert on Earth in Chile.*

*Currently, Dr. Barsony is investigating the formation mechanisms and properties of free-floating planetary mass objects in the nearest star-forming regions to Earth, with state-of-the-art, near-infrared, multi-object spectrographs on the Keck and Subaru telescopes atop Mauna Kea on the Big Island of Hawaii.*

## **PRESIDENT'S MESSAGE**

As the Randall Museum begins renovations to their auditorium and undertakes other improvements, we have our new home at the Presidio - at the Observation Post / Building 211. The first lecture at the Presidio went quite well. We had a near record turnout with over 120 attending! There were a lot of familiar faces and many first time visitors too. The lecture by Franck Marchis, PH.D., from the SETI Institute and UC Berkeley was fascinating - discussing the evolution of observing and how technology and sharing of knowledge and influence progressed the field of Planetary Astronomy to today and into the future. Franck dealt well with a few minor technical difficulties. This month's lecture on Tuesday March 17th should be even better as we're refining details and setup at our new home!

One of our discussions at the February SFAA Directors meeting was our calendar. In addition to our regular lectures, and star parties in the city and on Mt Tam, we often have special events. We're looking at the entire year and planning for some great events. We are looking even further out - planning a grand event for the August 2017 solar eclipse! But in the short term, we have some great events approaching. Our volunteering with the Dominican University of California continues with our scopes shared at their Big History event on March 23rd. Also, at Ocean Beach, early morning of April 4th we're planning on experiencing the lunar eclipse. Please keep an eye on our calendar online as it's updated with all the details.

**Douglas Smith**

**2015 SFAA President**

## **SFAA EVENTS – MARCH/APRIL 2015**

**MAR**

**March 17**

**Tuesday – 7:00 pm – 9:00 PM**

Astronomy Lecture @ Presidio Observation Post

**MAR**

**March 21**

**Saturday - 5:00 pm – Mar 22 @ 5:00 am**

Mt. Tam Members Night – Messier Marathon  
Rock Springs Parking Lot - Mt Tam

**MAR**

**March 28**

**Saturday - 7:00 pm – 11:00 pm**

San Francisco City Star Party @ Point Lobos, San Francisco

**APR**

**April 18**

**Saturday - 5:00 pm – Apr 19 @ 2:00 am**

Mt. Tam Members Night @ Rock Springs Parking Lot - Mt Tam

**APR**

**April 21**

**Tuesday**

Astronomy Lecture @ Presidio Observation Post  
Apr 21 @ 7:00 pm – 9:00 pm

# **SAN FRANCISCO AMATEUR ASTRONOMERS UPCOMING LECTURE**

**April 21, 2015**

**NORBERT WERNER, PhD**

**Stanford University**

**Kavli Institute for Particle Astrophysics and Cosmology (KIPAC)**



## **THE DARK SIDE OF THE UNIVERSE**

**DARK MATTER  
DARK ENERGY  
AND  
SUPERMASSIVE  
BLACKHOLES**

Most of the Universe is unseen: 95% of its contents consist of dark matter and dark energy, which we do not yet understand. But even when it comes to the 5% “normal” matter, we can only see the tip of the tip of the iceberg. My talk will focus on this unseen "Dark Side of the Universe" and will show how the unseen dark energy, dark matter, and the invisible supermassive black holes sculpt the observed Universe.

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*Dr. Werner is an astrophysicist at the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC) at Stanford University. He can also often be found at the Japanese Space Agency (ISAS/JAXA) near Tokyo where, next to his everyday research, he is helping to prepare the initial observing program for the upcoming Japanese-US Astro-H satellite. Before coming to sunny California, he earned his PhD at SRON Netherlands Institute for Space Research, in the rainy but magically beautiful city of Utrecht in the Netherlands. He spent his undergraduate years at the Safarik University in Kosice in his home country, Slovakia.*



**Saturday, March 21  
5:00 PM to 5:00 AM**

**Mt. Tam Members Night  
Rock Springs Parking Lot  
Mt Tam**

## **MESSIER MARATHON**

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Messier Marathon is a term describing the attempt to find as many Messier objects as possible in one night. Depending on the location of the observer, and season, there are a different number of them visible, as they are not evenly distributed in the celestial sphere. There are heavily crowded regions in the sky, especially the [Virgo Cluster](#) and the region around the [Galactic Center](#),

while other regions are virtually empty of them. In particular, there are no Messier objects at all at Right Ascensions 21:40 to 23:20, and only the very northern [M52](#) is between RA 21:40 and 0:40. This chance effect leads, at considerably low northern latitudes on Earth (best around 25 degrees North), to the chance to observe [all 110 Messier objects](#) in one night! This opportunity occurs once every year, around mid- to end-March; the best time to try is of course when the Moon is near its new phase. For the upcoming years until 2100, we give [best Messier Marathon dates here](#).

Note: Most Messier Marathoners accept [NGC 5866 as M102](#), either in account of [historical evidence](#), or at least as substitute accepted for the Messier Marathon, and thus arrive at actually 110 different objects. We recommend to do so, but you decide what you want to do.

Note2: Referring to the objects [M51B \(NGC 5195\)](#) and [M109B \(NGC 3953\)](#): Virtually all observers of [M51](#) will also see M51B. For the M109/M109B discussion, we propose to recognize as "score" either of the objects, [M109 \(NGC 3992\)](#) or M109B (NGC 3953), or certainly both.

Messier Marathon was invented independently by several North American (including **Tom Hoffelder**, **Tom Reiland** and **Don Machholz**) and perhaps one Spanish amateur astronomers and groups, in the 1970s. It was probably first in the night of March 23/24, 1985 that **Gerry Rattley** from Dugas, Arizona, completed the list and hunted down all 110 Messier Objects in one night; while he was the first to achieve this goal, it was only about one hour later that **Rick Hull** duplicated this success from Anza, California. This is however possible only under exceptionally good observing conditions, and at a preferred location. Anyway, [some Messier Marathon tips](#) may help to be [even] more successful with this endeavor, i.e., see one or a few objects more.

Meanwhile, a number of clubs started to hold more considerable Messier Marathon events, notably in Arizona. In 1981, the [Saguaro Astronomy Club \(SAC\)](#) held their first Messier Marathon with about 40 participants, the first in a row of meanwhile 27 events (as of 2015) sponsored by this club; Gerry Rattley's first 110 objects success of 1985 happened on their fourth event. Since 1993, SAC sponsors the famous **All Arizona Messier Marathons** held annually near Arizona City and organized by **A.J. Crayon**. Other clubs throughout the world are also holding their Messier Marathon events semi-annually.

The more complete Messier Marathon history can be found in **Don Machholz's** booklet, *The Messier Marathon Observer's Guide* ([Machholz 1994](#)), or its newer edition or successor, *The Observing Guide to the Messier Marathon* ([Machholz 2002](#)), which moreover gives a most useful proposition for the [search sequence](#). It also points out that less complete Messier Marathons may be run at every time in the year, the percentage depending on location and time.

Southerners may prefer other marathons. For the time around September each year, there is another 110-object marathon for mid-northern observers, the [Messier Plus Marathon](#) (compiled by Wally Brown and Bob Buckner). Experienced observers have compiled more massive lists for marathoning up to over 500 objects a night; Don Machholz reports that he hunted down 599 deep-sky splendors in one night !

**Tom Polakis** has investigated the [observing window](#) for finding all 110, depending on geographic latitude ([Polakis 2006](#)).

Since their invention, Messier Marathons had to face some opposition. As Don Machholz points out, the major complaint is that "rushing through a Messier [or other] list does not allow to study each" object seriously. However, as nothing prevents you from returning to them, and studying them with more time, in other nights, "such criticism can be ignored, since the Messier Marathon is not designed for everyone. The critic can spend the night looking at a shorter list of wonders. A counterpoint to this resistance is that the Marathoner will see nearly all the Messier Catalogue in one night -- many amateur astronomers [and even more professionals, believe me - hf :-)] never see the whole catalogue in their whole lifetime. Additionally, one's searching and locating skills, necessary in most aspects of astronomy, are sharpened during the Marathon. The benefit of seeing, in one night, the major building blocks of our Galaxy: open and globular clusters, diffuse and planetary nebulae, along with other galaxies, cannot be ignored. Finally, there is a satisfaction of working with others toward a common goal, and then finally achieving it [hopefully !]." Rumors say that there are some hardliners who feel the same satisfaction when they do it alone..

Marathons are of course enriched if other appealing celestial events can fill in the pauses which normally occur if you have hunted down everything you can at a time, and wait for the morning objects to rise. In 1997, the outstanding naked-eye comet Hale-Bopp (C/1995O1) gave an extraordinary spectacle exactly at Messier Marathon time in March and April, to celebrate the Messier Marathon's 20th birthday, similar to 1996's Hyakutake (C/1996B2). In 1998, there was no such bright comet, but a considerable supernova, [SN 1998S](#) in [NGC 3877](#) (in Ursa Major), had timely occurred and brightened up to 12th magnitude to enrich the Messier Marathon. In 2002, there occurred two remarkable add-ons just in time: the most remarkable [supernova 2002ap](#) occurred in [M74](#) in late January, and comet C/2002 CI (Ikeya-Zhang) was discovered, and brightened to naked-eye visibility in March and April! In 2006, [supernova 2006X](#) flashed up in [M100](#) in early February, as for 2009 did [SN 2008in](#) in [M61](#), in 2012 it was [SN 2012aw](#) in [M95](#); these were all giving an interesting addition of the marathon. In 2013, bright comet C/2011 L4 (PANSTARRS) has delivered its show. In 2014, two supernova have occurred in Messier galaxies: Bright [SN 2014j](#) in [M82](#) and [SN 2014L](#) in [M99](#). We don't know in advance what extras will give future Messier Marathons additional value, but intend to provide the relevant information here as soon as it is available. Check for more info on upcoming or current Messier Marathons: [Messier Marathon 2015](#).

Another common extension of the Messier Marathon is to add a solar system marathon, i.e. to try to observe as many of the 8 planets besides Earth during the Messier Marathon night (e.g., 1999 to 2004 offered the opportunity to find all 8). 2006 to 2008 may have been the last opportunities to achieve the Nine-Planet goal; then Uranus and later Neptune will be too close to the Sun during Messier Marathon time for a considerable number of years, until about the 2040s, but there always remain some of them.

There have been several propositions to make the Messier Marathon more challenging for those who do it repeated times. An interesting proposition was brought to my attention by **Tom Hoffelder** one of the Messier Marathon inventors. He points out that he and his friend **Greg Zentz**, who has also completed a number of Marathons, came up with the idea of doing it completely from memory. This would mean no star charts or notes of any kind, only a list of the objects in order of search. They are thinking of trying it and calling it "M cubed" (Messier Memory Marathon). On March 29-30, 2003, **Don Machholz** was the first marathoner to achieve a more notable success in a "M cubed" marathon, as he hunted down as many as 108 Messier objects from memory without any further help. On March 25/26, 2004, it was again **Don Machholz** who successfully did the first full 110-object score in a "M cubed." Marathoner and A.L. Master Observer **Stephen Saber** has also been running the M-Cubed for several years. His method adds the memorization of the entire search sequence.

Another interesting possibility is running a *photographic* Messier Marathon. This was, to our knowledge, first undertaken by **Tim Hunter** and **Dan Knauss** of Grasslands Observatory, Arizona in March 1988; see their [report](#) and [photo album](#).

## Messier Marathon Search Sequence

Here are the links to the Messier Marathon Search Sequence List in various formats, the sequence taken from Don Machholz's book *The Messier Marathon Observer's Guide*. Select the form you would like to view this list:

- Messier Marathon Search Sequence List: [with Icons](#), in [text mode](#)
- [Messier Marathon Search Sequence with Data](#) [ascii; also available with [Steven O'Meara's data](#) instead of ours]
- [Messier Marathon Search Sequence Short Sheet](#) [ascii]
- [Messier Marathon Form \(ascii\)](#): Just fill in your observations/data

Slightly different sequences and other Messier Marathon related stuff have been published in recent years:

- [Phil Harrington's Planning Your Messier Marathon page](#), containing the slightly different sequence which was printed in the March 1994 issue of *Astronomy* magazine.
- [Dawn Jenkins](#) has made useful hints available [how to hold a Messier marathon](#), and provided her own [marathon sequence](#), as part of her general [observing page](#).

- David Levy, in his book *The Sky: A User's Guide* ([Levy 1991](#)), also gives a slightly different sequence (which he quotes to Don Machholz and John Kerns); pp. 222-225 of his book contain this list together with his 1983 results.
- [Bill Ferris' alternative observing sequence](#)
- [Stephen Saber's Messier Marathon from Memory \(M-cubed\) Search Sequence](#)

The best observing sequence may be particularly different for latitudes notably different from about 40deg North. We can offer an example:

- [Marathon Sequence for latitude 18.5](#) (contributed by Harshad Abhyankar, Pune, India)

More Messier Marathon Materials:

- [Best Messier Marathon dates](#) to 2050 - [Historic best dates](#) since 1977
- [Some Messier Marathon tips](#)

Other Messier Marathon Resources:

- [Tips on Participating in the Messier Marathon](#) by John Barra
- [Stargazers Online Guide to the Messier Marathon](#), by Richard Bell
- [Dirk Panczyk's German language Messier Marathon page](#)
- [Bill Ferris' Messier Marathon page](#)
- Messier Marathon Observing Window for a Perfect Score against Latitude, by Tom Polakis ([Polakis 2006](#)): [Local archival copy](#)
- [Stephen Tonkin](#) offers a printable [Messier Marathon Logsheet](#) (PDF)
- [COAA](#) (Algarve, Portugal) provides the Windows 3.x (up) program [MESSMARA](#), which creates graphs and lists on which Messier objects can be seen from a particular location in a given night.

**We collect actual Messier Marathon [observer's results](#) !**

- [All Reported Messier Marathon Results](#) (since 1977)
- Look at our [All Reported Results Table](#)!
- [Messier Marathon Eternal Hall of Fame](#) - all reported Messier Marathon results with full success of 110 observed Messier Objects!
- **A.J. Crayon** has provided a comprehensive [Analysis of Messier Marathons](#) (derived from these results)!

Please [notify me](#) if you'd like to have your result/score/report/link/addition/correction to be added !

If you have observed all Messier objects, even *not* in one night all together, we encourage you to announce this fact on your homepage in the web. You are then granted the right to use a [specific logo certifying that you have observed all 110 Messier objects](#).

## References

- David H. Levy, 1991. *The Sky: a user's guide*. Cambridge University Press.
- Don Machholz, 1994. *Messier Marathon Observer's Guide -- Handbook and Atlas*. Make Wood Products, P.O. Box 1716, Colfax, CA 95713 (USA).
- Don Machholz, 2002. *The Observing Guide to the Messier Marathon. A Handbook and Atlas*. Cambridge University Press. Second, enhanced and extended edition of [Machholz \(1994\)](#).
- Tom Polakis, 2006. *Messier Marathon Observing Window*. Posted to the Yahoo group amastro on February 7, 2006.

**MONDAY - MARCH 23, 2015**

**6:30 P.M. - 9:30 P.M.**

**DOMINICAN UNIVERSITY, SAN RAFAEL  
INVITES SAN FRANCISCO AMATEUR ASTRONOMERS  
TO PARTICIPATE IN "BIG HISTORY" PROGRAM**



San Francisco Amateur Astronomers is invited to again take part in the Dominican University "Big History" program in San Rafael. SFAA members are welcome to bring telescopes and join an evening of pizza and stargazing with students, faculty and administration of Dominican. The event takes place on Monday evening March 23rd from 6:00 pm to 9:30 pm at the campus in San Rafael.

**IF YOU CAN BRING YOUR TELESCOPE AND TAKE PART,**  
please contact PAUL SALAZAR at [salazar.paul@gmail.com](mailto:salazar.paul@gmail.com)

**Forest Meadows, Dominican Campus, San Rafael**

**In partnership with the Pseads Institute and San Francisco Amateur Astronomers**

**Learning to See the Star (and Remnant Stardust)  
in Your Own Being**



Explore the cosmos of your own being during this evening under the stars. Consider your own narrative in the narrative of the universe through astronomical and creation stories, and journey through the constellations and celestial bodies of the night sky above Dominican with local astronomers. Grab a blanket, have some hot chocolate, and bask in the vastness of it all.

*The Pseads Institute provides custom, quality experiences designed to engage learners—first inwardly, then rippling outward through local community and beyond—in ways that are original, creative, and fun.*

*Since 1952, The San Francisco Amateur Astronomers have been promoting the appreciation of the wonders of the night sky through public outreach, star-viewing trips, scientific lectures, telescope-making clinics, and more. This will be their third visit to Dominican to share their telescopes and their love of astronomy.*



# CAMPUS MAP AND DIRECTORY



Academic Affairs	Guzman Hall	Business Services	Bertrand Hall	Guzman Lecture Hall	Guzman Hall	Public Relations	Guzman Hall
Academic Support Services	Bertrand Hall	Campus Ministry	Edgehill Mansion	Gymnasium	Conlan Center	Purchasing	Bertrand Hall
Admissions	Magnolia House	Career Services	Bertrand Hall	School of Health and Natural Sciences	Guzman Hall	Registrar	Bertrand Hall
Advancement	Guzman Hall	Chapel	Edgehill Mansion	Health Center	Bertrand Hall	Residence Halls	Edgehill Village, Fanjeaux, Meadowlands, and Pennafort
Alumni Relations	Edgehill Mansion	Chief Academic Officer	Guzman Hall	Housing Office (Residential Life)	Pennafort Hall	Security Desk	Bertrand Hall
Art Gallery	Alemany Library	Chilly's Café	Caleruega Hall	Human Resources	Carriage House	Service-Learning	Fanjeaux Hall
School of Arts, Humanities and Social Sciences	Angelico Hall	Computer Labs	Alemany Library	Information Technology	Alemany Library	Shield Room	Caleruega Hall
ASDU (Associated Students of Dominican University of California)	Fanjeaux Hall	Counseling Services	Bertrand Hall	Mail Services	Bertrand Hall	Student Life	Edgehill Mansion
Athletics Offices	Conlan Center	Creekside Room	Caleruega Hall	Marketing	Guzman Hall	Suzuki School of Music	Angelico Hall
Bon Appétit	Conlan Center	School of Education and Counseling Psychology	Bertrand Hall	Nursing Labs	Martin de Porres and Ralph Minor	Swimming Pool	Conlan Center
Bookstore	Caleruega Hall	ELS Language Centers	Pennafort Hall	Other Lifelong Learning Institute	Anne Hathaway	Teaching and Learning Center	Bertrand Hall
School of Business and Leadership	Fanjeaux Hall	Financial Aid	Bertrand Hall	President	Guzman Hall	Weight Room/Multipurpose Room	Conlan Center
	Bertrand Hall			President's Residence	Barowsky House		

Dominican University of California • 50 Acacia Avenue, San Rafael, California 94901 • 415-457-4440 • [www.dominican.edu](http://www.dominican.edu)

University Map  
 Parking Map  
 San Rafael Map  
 Marin County Map  
 Public Transportation Information  
 can be found [here](#).

## **APRIL 4, 2015 TOTAL LUNAR ECLIPSE**

### **SAN FRANCISCO AMATEUR ASTRONOMERS ECLIPSE VIEWING PARTY**

**OCEAN BEACH**

**SAN FRANCISCO**

**4:00 a.m. – 6:00 a.m.**

**Check website at [www.sfaa-astronomy.org](http://www.sfaa-astronomy.org) for further details**

**Pacific Daylight Time (April 4, 2015)**

**Partial umbral eclipse begins: 3:16 a.m. PDT**

**Total eclipse begins: 4:58 a.m. PDT**

**Greatest eclipse: 5:00 a.m. PDT**

**Total eclipse ends: 5:03 a.m. PDT**

**Partial eclipse ends: 6:45 a.m. PDT**

**Moon may set before end of partial eclipse**



# Total Lunar Eclipse of 2015 Apr 04

Ecliptic Conjunction = 12:06:41.8 TD (= 12:05:32.7 UT)

Greatest Eclipse = 12:01:23.6 TD (= 12:00:14.5 UT)

Penumbral Magnitude = 2.0792    P. Radius = 1.1853°    Gamma = 0.4460  
 Umbral Magnitude = 1.0008    U. Radius = 0.6522°    Axis = 0.4046°

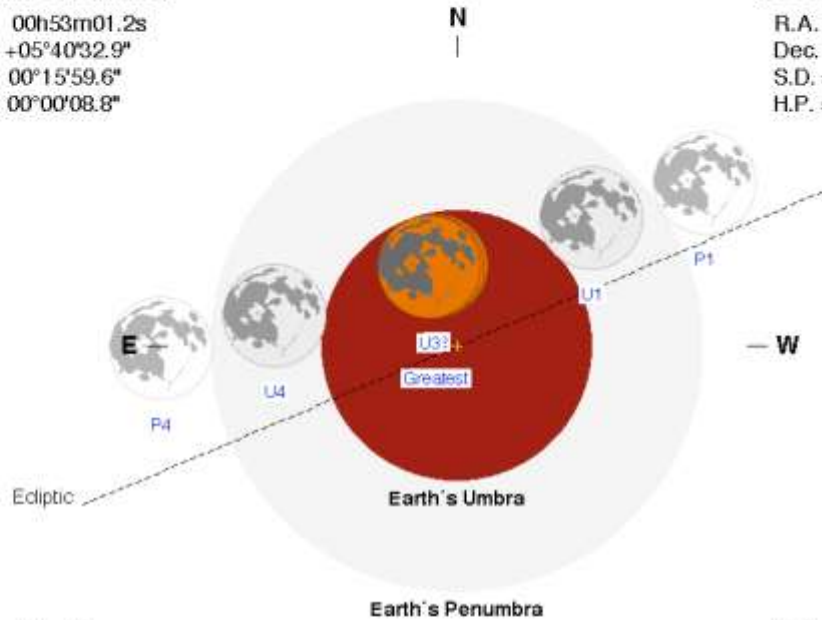
Saros Series = 132    Member = 30 of 71

## Sun at Greatest Eclipse (Geocentric Coordinates)

R.A. = 00h53m01.2s  
 Dec. = +05°40'32.9"  
 S.D. = 00°15'59.6"  
 H.P. = 00°00'08.8"

## Moon at Greatest Eclipse (Geocentric Coordinates)

R.A. = 12h53m29.7s  
 Dec. = -05°17'20.2"  
 S.D. = 00°14'49.9"  
 H.P. = 00°54'25.9"



## Eclipse Durations

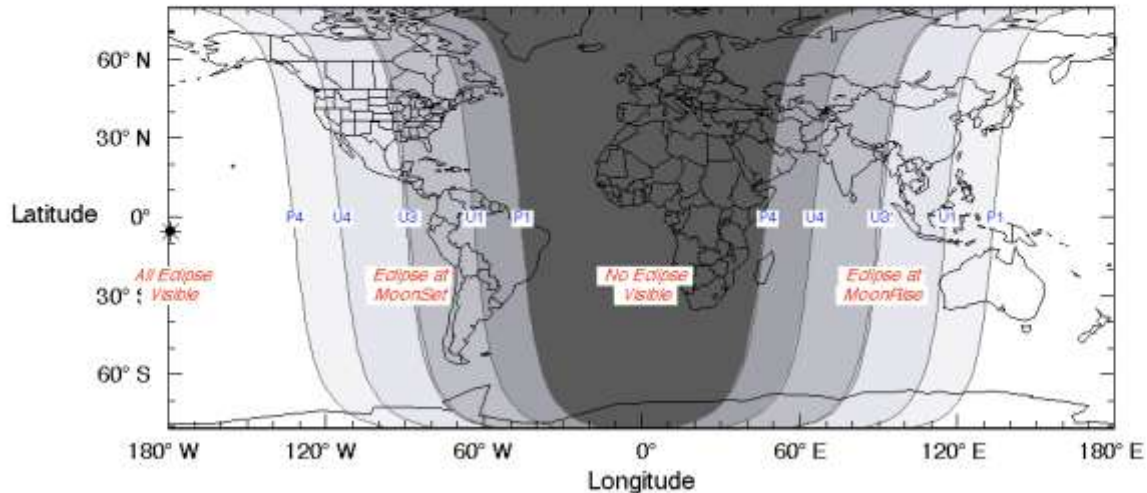
Penumbral = 05h57m32s  
 Umbral = 03h29m00s  
 Total = 00h04m43s

$\Delta T = 69$  s  
 Rule = CdT (Danjon)  
 Eph. = VSOP87/ELP2000-85

## Eclipse Contacts

P1 = 09:01:27 UT  
 U1 = 10:15:45 UT  
 U2 = 11:57:54 UT  
 U3 = 12:02:37 UT  
 U4 = 13:44:46 UT  
 P4 = 14:58:58 UT

F. Espenak, NASA's GSFC  
[eclipse.gsfc.nasa.gov/eclipse.html](http://eclipse.gsfc.nasa.gov/eclipse.html)



## 2015 STAR PARTY DATES

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



Saturday, March 28<sup>th</sup>, Lands End, 7:00 PM  
Friday, April 24<sup>th</sup>, Presidio Parade Grounds, 7:00 PM  
Thursday, May 28<sup>th</sup>, The Exploratorium, 8:00 PM  
Saturday, June 27<sup>th</sup>, Presidio Parade Grounds, 8:00 PM  
Friday, July 24<sup>th</sup>, Lands End, 8:00 PM  
Tuesday, August 25<sup>th</sup>, Presidio Parade Grounds, 7:30 PM  
Thursday, September 24<sup>th</sup>, The Exploratorium, 6:30 PM  
Thursday, October 22<sup>nd</sup>, Presidio Parade Grounds, 6:00 PM  
Saturday, November 21<sup>st</sup>, Lands End, 5:30 PM  
Saturday, December 19<sup>th</sup>, Presidio Parade Grounds, 5:30 PM

**Friends of Mt Tam** - Helping you enjoy your state park

### FRIENDS OF MT. TAM

#### Mt Tam Astronomy Programs Start April 25

Mt Tam Enthusiasts-

Spring is almost here! Well, it has felt like spring for some time, and a more newsworthy statement would be that winter has arrived, if it comes this year at all, but I'm referring to the calendar, not the weather!

Our astronomy programs on Mt Tam will once again run monthly April through October and are starting **April 25 with Dr. Jacob Cohen**, Chief Scientist at NASA-Ames, revealing NASA's vision for human flight from Earth to explore and live in space in his talk entitled "**Stepping Out of The Nest**". This talk just the beginning of this season's wonderful series looking at what we have learned about our solar system and our place in it. The full schedule is attached, but if you prefer not to download files you can check it out on the website:

[www.friendofmttam.org/astronomy](http://www.friendofmttam.org/astronomy).

We are excited to be enhancing our series this year with a "Full Moon Sci-Fi Movie Night" as we gather to watch the classic film *Contact* based on the book by Carl Sagan, then discuss the science in it with Dr. Carolyn Porco, an advisor on the film.

**Mark your calendars now as you won't want to miss a single program!** And thank you for helping spread the word about our events.

We look forward to your joining us on Mt Tam for a full spectrum of astronomical edu-tainment again this year. If you have friends to add to this mailing list let us know. And if you don't want to receive the monthly reminders about the programs anymore, again, just let us know.

PS

Hopefully while waiting for our programs to start you are keeping tuned to the heavens and looking up. In case you missed the spectacular conjunction of Venus, Mars and the crescent moon last Thursday below is a photo by Jim DeManche of the Sonoma County Astronomical Society. Thanks for sharing, Jim!

TINKA ROSS

# Astronomy Nights on Mt. Tamalpais

<p><b>April 25</b> 8:30pm</p>	<p><b>Dr. Jacob Cohen, NASA-Ames, Chief-Scientist</b>  <b>“Stepping Out of the Nest”</b>          How does research into the search for water and habitable planets, astrobiology, space biology, small satellites, advanced manufacturing, autonomous vehicles and synthetic biology make science fiction into science reality? NASA-Ames scientists have a vision for human flight from our Earthly nest to explore and live in space.</p>
<p><b>May 23</b> 8:30pm</p>	<p><b>Dr. Imke de Pater, UC Berkeley, Chair Astronomy Dept</b>  <b>“What Wonderful Worlds: Exploring our Solar System”</b>          Our knowledge about our own Solar System has increased by leaps and bounds over the past few decades due to a combination of spacecraft missions and technical advancements on ground based telescopes. Why do we explore our Solar System? Review the numerous bodies now known to orbit the Sun, now familiar to us as individual worlds. Learn more about impacts on Jupiter, volcanic activity on Io, and planetary rings.</p>
<p><b>June 20</b> 8:30pm</p>	<p><b>Andrew Fraknoi, Foothill College, Chair Astronomy Dept</b> <a href="http://foothill.edu/ast">foothill.edu/ast</a>  <b>“The Top Tourist Sights of the Solar System: Where Bill Gates’ Great-Granddaughter Will Go on Her Honeymoon”</b>          Using spectacular images from space probes and the world’s largest telescopes, explore the most intriguing future “tourist destinations” among the planets and moons in our cosmic neighborhood. Among our stops will be the 4,000-mile lava channel on Venus, the towering Mount Olympus volcano on Mars, the awesome Verona Cliffs on the moon Miranda (,the tallest “lover’s leap” in the solar system), and the recently discovered steam geysers on Saturn’s intriguing moon Enceladus.</p>
<p><b>July 11</b> 8:00pm</p>	<p><b>MOVIE NIGHT NEW EVENT THIS YEAR</b>  <b>Screening of the 1997 classic science fiction film “Contact”</b>          Book by <b>Carl Sagan &amp; Ann Druyan</b>, Directed by <b>Robert Zemeckis</b> Post discussion led by <b>Dr. Carolyn Porco</b>, Science Advisor on the film Jodie Foster portrays the film’s protagonist, Dr. Eleanor “Ellie” Arroway, a SETI scientist who finds strong evidence of extraterrestrial life and is chosen to make first contact. The film was released on July 11, 1997, grossed \$171 million worldwide and won the Hugo Award and received multiple Saturn awards and nominations.</p>
<p><b>July 25</b> 8:30pm</p>	<p><b>Dr. Phil Marshall, Kavli Institute, Project Scientist</b> <a href="http://slac.stanford.edu/~pjm">slac.stanford.edu/~pjm</a>  <b>“Weighing Galaxies”</b>          We live in a galaxy of about a hundred billion stars, the Milky Way. As the sky over Mount Tam darkens, and the stars in the disk of our galactic home come into view, see how we are mapping out where the Dark Matter is, both in our local group of galaxies and further out in the depths of space. Galaxies are much heavier than they look – what could that mean for our understanding of how stars form, and what Dark Matter is?</p>
<p><b>Aug 22</b> 8:30pm</p>	<p><b>Dr. Carolyn Porco, Space Science Institute, CICLOPS</b>  <a href="http://Directorspace.science.org/about_ssi/staff/porco.html">Directorspace.science.org/about_ssi/staff/porco.html</a>  <b>“In the Land of Enchantment: A Decade Exploring Saturn”</b>          A glistening spaceship, with seven lonely years and billions of miles behind it, glides into orbit around a softly-hued, ringed planet. A flying-saucer shaped machine descends through a hazy atmosphere and lands on the surface of an alien moon. These visions are not a dream but tell of the explorations of the Cassini spacecraft and its Huygens probe in 2004. Come along for the ride, and witness the sights and magic worked by these emissaries from Earth to the enchanting realm of Saturn.</p>
<p><b>Sept 19</b> 8:00pm</p>	<p><b>Dr. Lynn Rothschild, NASA-AMES, Synthetic Biologist</b>  <a href="http://solarsystem.nasa.gov/people/profile.cfm?Code=RothschildL">solarsystem.nasa.gov/people/profile.cfm?Code=RothschildL</a>  <b>“A Biological Perspective on the Meaning of Time”</b>          Life is a phenomenon that integrates processes ranging from the near instantaneous reactions of photosynthesis to the more stately pace of evolution. How are these processes with radically different time scales creating and maintaining the diversity of life on earth? What are the clocks that nature uses to time them? And how is modern biology being used to alter the natural time scales?</p>
<p><b>Oct 17</b> 7:30pm</p>	<p><b>Dr. Geoff Marcy, UC Berkeley, Professor of Astronomy</b>  <a href="http://astro.berkeley.edu/people/faculty/marcy.html">astro.berkeley.edu/people/faculty/marcy.html</a>  <b>“Prospects and Hunting for Intelligent Life in the Universe”</b>          Not one microbe has been found anywhere in the universe, except on Earth, nor have any intelligent civilizations been found. Is our Galaxy teeming with life, as suggested by science fiction, or might intelligent life be rare in the Milky Way Galaxy? New telescopes and techniques can answer these questions.</p>

# BAY AREA ASTRONOMY EVENTS

Kenneth Lum

<http://tech.groups.yahoo.com/group/bayastro/?v=1&t=directory&ch=web&pub=groups&sec=dir&slk=91>

## BAY AREA REGULARLY-SCHEDULED EVENTS

<p><b>EVERY FRIDAY NIGHT</b> <b>7:00 PM – 10:00 PM</b> excluding major holidays</p> <p><b>The Telescope Makers' Workshop</b></p> <p><b>CHABOT SPACE AND SCIENCE CENTER</b> 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.</p> <p>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!</p> <p>For more information call or email Richard Ozer at <a href="mailto:rozer@pacbell.net">rozer@pacbell.net</a> or phone (510) 406-1914.</p>
<p><b>EVERY FRIDAY &amp; SATURDAY EVENING</b>, weather permitting <b>7:30 PM – 10:30 PM</b></p> <p><b>CHABOT SPACE AND SCIENCE CENTER</b> 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><b>Sunset – 5:11 PM</b> <b>(TWICE MONTHLY)</b></p> <p><b>Inclement weather (clouds, excessive wind and showers) will cause the event to be canceled without notice.</b></p> <p><b>SAN MATEO COUNTY</b></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, <b>(650)592-2166</b>, or send an email to <a href="mailto:SMCAS@live.com">SMCAS@live.com</a> or call Ed Pieret at <b>(650)862-9602</b>.</p>

<p><b>ASTRONOMICAL SOCIETY STAR PARTY</b></p>	<p><b>Reasons to Attend</b>          If you have kids interested in space or planets bring them here for a real life view of planets, nebula, star clusters and galaxies.          If you are thinking of buying a telescope or want help using a telescope you own, come here to talk with experienced users. If you think you might have an interest in astronomy come and talk to experienced amateur astronomers.</p> <p><b>Cautions</b>          Dress warmly and wear a hat.          Visitors should park on the street and walk into the park so your headlights don't affect the observer's dark adaptation.          Only park in the parking lot if you are arriving before dark and plan to stay until the end of the event.          You shouldn't need lights but if you feel you do, only bring a small flashlight with the lens covered using red cellophane or red balloon.          Please respect the telescopes and ask permission from the owner if you wish to touch.          Parents, please watch your children.          The park is residential, and adjacent to homes and backyards, please keep noise to a minimum.</p> <p><b>Schedule Time</b>          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 SATURDAY MORNING OBSERVATORY 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.          Admission is free.</p> <p>Foothill Observatory is located on the campus of Foothill College in Los Altos Hills, CA. Take Highway 280 to the El Monte Rd. exit. The observatory is next to parking lot 4. Parking at the college requires visitor parking permits that are available from the machines in the parking lots for \$ 3.00.</p>
<p><b>EVERY CLEAR FRIDAY EVENING 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>

## BAY AREA SCHEDULED EVENTS – MARCH 2015

Sunday, March 15  
5:45 PM - 9:00 PM

**EAST BAY  
ASTRONOMICAL  
SOCIETY  
CHABOT SPACE &  
SCIENCE CENTER,  
10000 Skyline Blvd  
91st Annual Awards  
Dinner  
Dellums Bldg  
Oakland, CA 94619**

Cost: \$35

**91<sup>ST</sup> ANNUAL DINNER AWARDS  
DR. IMKE DE PATER, PROFESSOR OF ASTRONOMY, UC BERKELEY**

### **WHAT WONDERFUL WORLDS: EXPLORING OUR SOLAR SYSTEM**

It's that time of year again, to honor our best and brightest, hear the latest in astronomical research, and to just eat, drink and be merry with our fellow amateur astronomers at the 91st annual Awards Dinner!

Our keynote speaker is Dr. Imke de Pater, Professor of Astronomy, UC Berkeley

See weblink for registration details

Website: <http://www.eastbayastro.org/>

Tuesday, March 17  
12:00 NOON

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

### **JEREMY TREGLOAN-REED, SETI INSTITUTE STARSPOTS AND THE DYNAMIC EVOLUTION OF HOT-JUPITER EXOPLANET SYSTEMS**

When a hot-Jupiter transits its host star and crosses an active region there is a possibility that it will occult a starspot. When this happens a starspot anomaly is usually seen in the resulting transit lightcurve. Generally viewed as a nuisance, the most common approach is to remove the affected data points before performing an analysis to determine the lightcurve properties. However, when a starspot anomaly is found in transit photometry it can allow a wealth of information to be discovered. Apart from determining the physical properties of the starspot (such as position, size and temperature) if a starspot anomaly is found in two sets of transit photometry and is due to the same starspot it is then possible to determine the stellar rotation period at the given latitude of the starspot. It is also possible to measure the sky-projected stellar obliquity of the system which can then begin to shed some light on the primary mechanism of the dynamical evolution of the system.

Tuesday, March 17  
8:00 PM

**SAN FRANCISCO  
AMATEUR  
ASTRONOMERS  
Observation Post  
Building 211  
211 Lincoln Blvd  
San Francisco, CA  
94129**

Cost: Free

**PLEASE NOTE NEW  
LOCATION FOR  
THIS SERIES.**

### **DR MARY BARSONY, SETI Institute BROWN DWARFS, PLANETARY MASS OBJECTS, AND THEIR DISKS IN THE NEAREST STAR-FORMING REGIONS**

Objects with masses ( $<0.08$  solar masses) too small to sustain hydrogen fusion were theorized to exist five decades ago, and discovered 30 years later, due to their extreme faintness. Even less massive ( $<13$  Jupiter or  $<0.01$  solar masses) are the planetary mass objects (PMOs), so-called because they are not orbiting a star. We have discovered large populations of such free-floating PMOs and brown dwarfs in the nearest star-forming regions to Earth, when they are at their brightest and most amenable to detection. Do such objects outnumber the stars in the Galaxy? Do they have their own planetary or moon systems? Could these sustain surface or subsurface liquid water for eons via tidal heating and thus provide environments conducive for the development of microbial life?



**Wednesday, March 18  
7:00 PM - 9:30 PM**

**Stanford University,  
Alway M106 -Stanford  
Medical Center  
E.D. Stone - Alway  
Building (07-307)  
300 Pasteur Dr  
There should be  
ample parking in the  
structure on corner of  
Campus Drive West  
and Roth Way.**

**LASER Leonardo Art  
Science Evening  
Rendezvous  
Stanford University  
Stanford, CA 94305**

**Cost: Free**

Special March LASER at Stanford: Imagining the Universe

• 7:00-7:25:

Roger Malina

(CNRS Marseille) on "Art and Science for the Space Age"

• 7:25-7:50:

Allison Leigh Holt

(Visual Artist) on "The Beginning Was The End: Hybrid Reality in Javanese Culture"

• 7:50-8:10:

Chris McKay

(NASA) on "Imagining life in the Universe" What would it mean if we found life outside the Earth?...

• 8:10-8:35:

• 8:35-9:00:

BREAK. Before or after the break, anyone in the audience currently working within the intersections of art and science will have 30 seconds to share their work. Please present your work as a teaser so that those who are interested can seek you out during social time following the event.

• 9:00pm-9:30pm: Discussions, networking.

You can mingle with the speakers and the audience

Room: Alway M106

**Tuesday, March 24,  
2015 7:30 pm**

**Kavli Auditorium  
SLAC National  
Accelerator  
Laboratory  
2575 Sand Hill Road  
Menlo Park, California  
94025-7015**

**Siegfried Glenzer**

**Jupiter in a Bottle: Extreme States of Matter in the Laboratory**

Description:

Normally we think of hydrogen as a gas. But elsewhere in the universe, hydrogen under extreme pressure can exist in more exotic states. In the center of Jupiter, hydrogen becomes liquid or even solid. In the center of the sun, hydrogen is a plasma that burns itself up by nuclear fusion. Very hot, dense hydrogen can eject particles that we see as cosmic rays. At SLAC, we are now studying these extreme states of matter in the laboratory. We apply enormous pressures to hydrogen samples and use our X-ray laser, the Linac Coherent Light Source, to take split-second photographs of the states that result. This lecture will describe these experiments. The information we are gathering has potential applications to astrophysics, controlled fusion and generation of proton beams for cancer therapy.

About the Speaker:

Siegfried Glenzer is the leader of the program on high energy density science at SLAC National Accelerator Laboratory. He joined SLAC as a distinguished scientist in 2013 to build a new program exploring matter in extreme conditions using high-power lasers and the Linac Coherent Light Source, SLAC's X-ray laser.

Glenzer did his undergraduate and graduate study at the Ruhr University in Bochum, Germany, where he received his PhD in 1994. He then went to Lawrence Livermore National Laboratory as a postdoctoral fellow and, in time, became the laboratory's group leader for plasma physics. At Livermore, he led the first inertial confinement fusion experiments on the National Ignition Facility. He has been a visiting lecturer at the University of California, Berkeley and an Alexander von Humboldt senior fellow at the University of Rostock and the Deutsche Elektronen Synchrotron (DESY) in Hamburg, Germany. Glenzer is a fellow of the American Physical Society and was awarded the society's 2003 John Dawson Award for Excellence in Plasma Physics Research. In 2014, he received the Ernest O. Lawrence Award of the U. S. Department of Energy.

Registration is required. Live stream begins on March 24 at 7:30 p.m.-more on this as we approach the date or check SLAC web site at:

<https://www6.slac.stanford.edu/community/public-lectures.aspx>

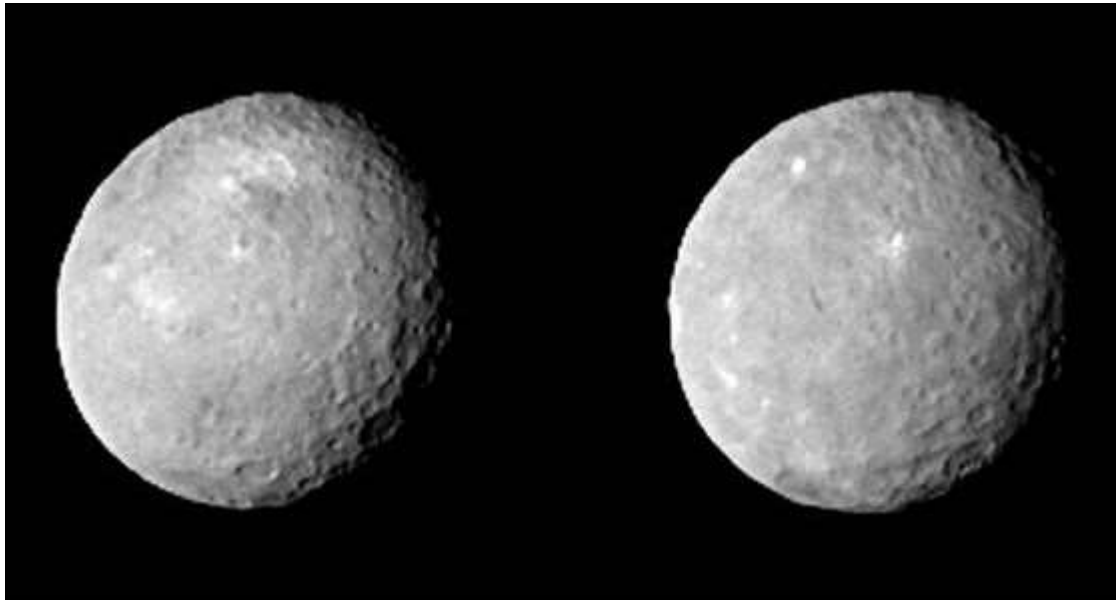
## NASA Science News

### Puzzling Bright Spots on Dwarf Planet Ceres

**Feb 27, 2015:** Cruising through the asteroid belt, NASA Dawn spacecraft is approaching dwarf planet Ceres, and some puzzling features are coming into focus.

"We expected to be surprised by Ceres," says Chris Russell, principal investigator of the Dawn mission, based at UCLA. "We did not expect to be this puzzled."

The camera on Dawn can now see Ceres more clearly than any previous image taken of the dwarf planet, revealing craters and mysterious bright spots.



These two views of Ceres were acquired by NASA's Dawn spacecraft on Feb. 12, 2015, from a distance of about 52,000 miles (83,000 kilometers) as the dwarf planet rotated. The images have been magnified from their original size. Image Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

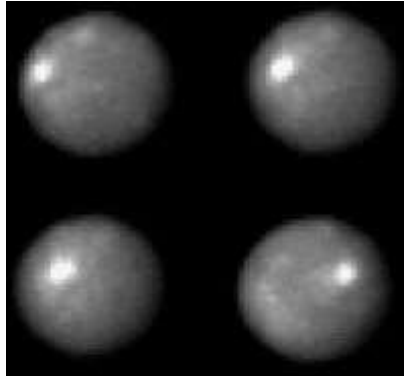
"We already knew from the Hubble Space Telescope that there were bright regions on Ceres," says Russell. "However, those images of the bright spots, taken more than 180 million miles away, appear to be large."

At close-range, Dawn's camera is revealing something different.

"As Dawn has come closer to Ceres, the bright spots have become brighter and smaller. Indeed, they are much brighter than the surrounding landscape and still unresolved in our images. The point of origin must be very small."

"Another way to express this is with fractals," he adds. "Most of the planetary surfaces we see are cratered in a random pattern. When you get closer, just as with fractals, the surface looks the same regardless of scale."

"However, the bright spot is telling us that there is a phenomenon that acts on a very small scale and NOT at the larger scale of the cratering."



*(Photo: Ceres as seen years ago with Hubble Space Telescope. Credit: NASA, ESA, J. Parker (Southwest Research Institute), P. Thomas (Cornell University), and L. McFadden (University of Maryland, College Park))*

"And since I don't have a clue what this is I am puzzled."

The view is about to improve even more. Dawn will be gently captured into orbit around Ceres on March 6, beginning a mission to map, explore and understand the dwarf planet. By the time Dawn is in its lowest altitude orbit at the end of this year, its pictures will be well over 800 times better than Hubble's.

"Even though Ceres is in the asteroid belt, it is entirely unlike asteroids," says Dawn's mission director, chief engineer and lead blogger Marc Rayman.

With an equatorial diameter of about 605 miles, Ceres has a surface area 38 percent of that of the continental United States, or four times the area of Texas, writes Rayman in his blog. Its size, nearly spherical shape and other factors have led astronomers to classify it as a dwarf planet. Moreover, it is the largest body between the sun and Pluto (another dwarf planet) that has never been visited by a spacecraft.

"Earth is about to be introduced to a fascinating new world," says Rayman.

Bright spots could be just the beginning of the surprises in store. Stay tuned to [Science@NASA](mailto:Science@NASA) for updates.

**Credits:**

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



## San Francisco Amateur Astronomers Application for New or Renewing Membership

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

### This application is for:

- New
- Renewing

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

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

\_\_\_\_\_

Email: \_\_\_\_\_

Home Telephone (optional): \_\_\_\_\_

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

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

Please mail to me a Mt. Tamalpais Parking Permit

### To complete the membership process:

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

**Treasurer, SFAA**  
**PO Box 15097**  
**San Francisco, CA 94115**

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