ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

Vol. 63, No. 5 – May 2015

GENERAL MEETING
THE PRESIDIO . OBSERVATION POST . BUILDING 211
211 Lincoln Boulevard, San Francisco
7:00 pm Doors Open . 7:30 pm Announcements . 8:00 pm Speaker
Effective February 17, 2015: SFAA's General Meetings occur on the 3rd TUESDAY of each month (except January)

TUESDAY, MAY 19 - 7:30 P.M.

MICHAEL BOLTE, UC Santa Cruz
BUILDING THE TMT: THE WORLD'S MOST ADVANCED GROUND-BASED TELESCOPE

Join Michael Bolte, professor of astronomy and astrophysics at UC Santa Cruz and member of the TMT International Observatory Board, for a presentation on ***Building the TMT: The Worlds Most Advanced Ground-Based Telescope.*** The Thirty-Meter Telescope (TMT) is a next-generation giant telescope. As the name suggests it will have a primary mirror that is 30 meters in diameter and composed of 492 hexagonal shaped segments. The primary mirror has very high-performance sensors and actuators that are used in a real-time control system to continuously keep the primary mirror in proper optical figure. The TMT will routinely operate with an adaptive optics system that will correct for the blurring of the atmosphere. There is a suite of very sophisticated instruments being designed and built along with the telescope.

Dr. Bolte will discuss the development of the telescope and project, the capabilities of the telescope and the highlights of the science case for the TMT. "With the TMT, we believe we will be able to obtain images and spectra of objects throughout the observable Universe," explains Bolte. "The science case includes everything from high-resolution studies of solar system objects, to the discovery of planets orbiting other stars, and from the co-development of supermassive blackholes and galaxies, to the first stars formed in the Universe some 12.5 billion years ago."

SAN FRANCISCO AMATEUR ASTRONOMERS' NEW HOME

NEW MEETING LOCATION
EFFECTIVE
FEBRUARY 2015

THE PRESIDIO OBSERVATION POST - BUILDING 211

http://www.presidio.gov/venues/Documents/Bldg%200211%20Floor%20Plan.pdf
Driving Directions

http://www.presidio.gov/venues/Pages/observation-post-at-the-presidio-driving-directions.aspx
Public transportation information link
http://www.presidio.gov/transportation/Pages/default.aspx

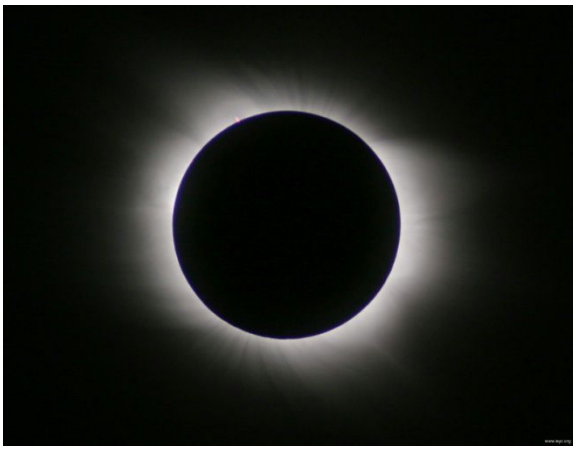
2015 STAR PARTY DATES

Scott Miller

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.

Thursday	May 28	The Exploratorium, 8:00 PM
Saturday	June 27	Presidio Parade Grounds, 8:00 PM
Friday	July 24	Lands End, 8:00 PM
Tuesday	August 25	Presidio Parade Grounds, 7:30 PM
Thursday	September 24	The Exploratorium, 6:30 PM
Thursday	October 22	Presidio Parade Grounds, 6:00 PM
Saturday	November 21	Lands End, 5:30 PM
Saturday	December 19	Presidio Parade Grounds, 5:30 PM

"We are 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."



SAN FRANCISCO AMATEUR ASTRONOMERS EXPEDITION

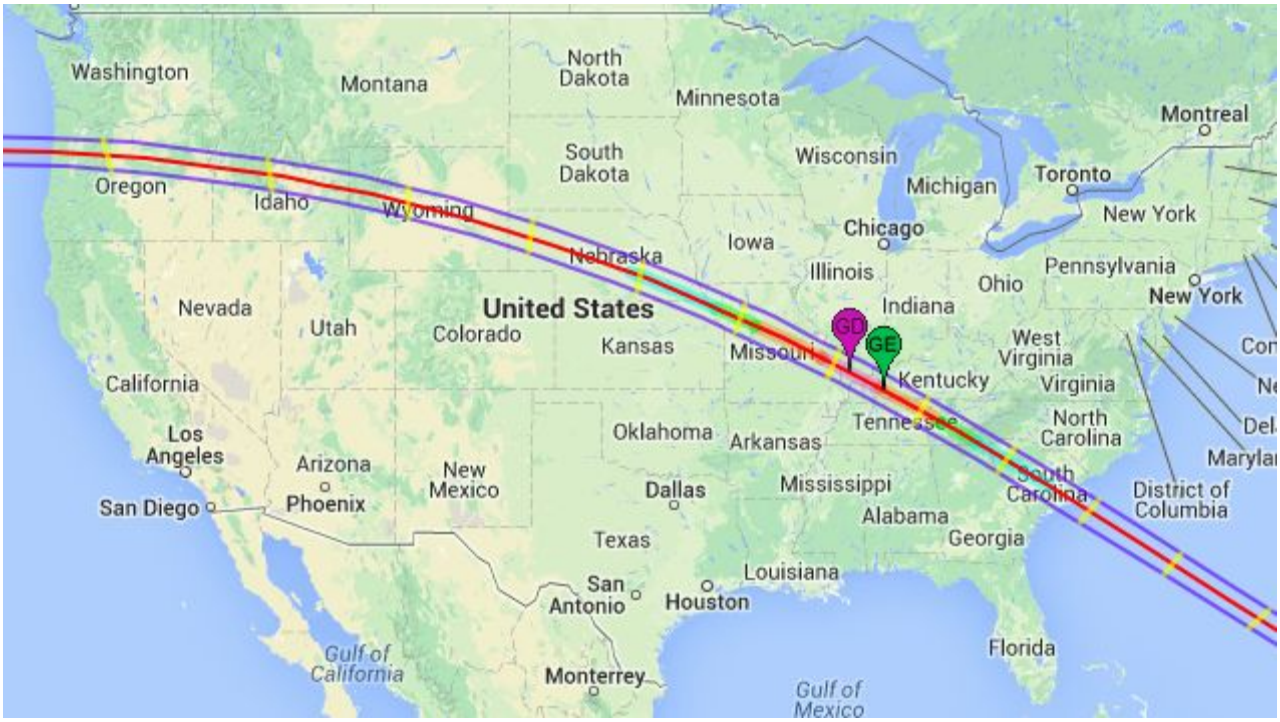
April 21, 2017

TOTAL SOLAR ECLIPSE
Jackson Hole, Wyoming
(Teton Mountains)

The San Francisco Amateur Astronomers is organizing an expedition to witness the August 21, 2017 Total Solar Eclipse. The eclipse will be visible across a broad swath of the USA, and club members will gather near Jackson Hole, Wyoming, to witness this spectacle high in the Teton Mountains. The trip is an opportunity for club members to gather in one place along the path of totality and journey together up the mountains for viewing of this spectacular astronomical phenomenon.

The club has arranged with a hotel in Teton Village, Wyoming, to enable advance bookings (2 years in advance!) with a special club rate of 10% discount. If you are a member of the SFAA and are interested in this, send an email to 2017eclipse@sfaa-astronomy.org and you'll be provided with additional details on the hotel and booking code. In the coming months the club will organize additional talks and events that will take place at the hotel on and before the date of totality. At this time, the most important thing is to book your hotel room so if you are at all considering this eclipse, get in touch and get your reservation in today. SFAA is not organizing air or ground transportation; that is left to each individual group or attendee.

If you have any other questions, send to 2017eclipse@sfaa-astronomy.org.



UPCOMING LECTURES

August 18, 2015

For some time, NASA has been looking beyond single-entity space transportation programs. Our future in space has never been more secure or as exciting. Over the last half century NASA was the sole organization to design our entire space program and to go ankle deep in the ocean that is our corner of the universe. With the knowledge and experience gained through risk and expenditure, the time has come to pay huge dividend to the investors. We are now for the first time in history, launching privately designed and built large scale space vehicles successfully. There are many corporations contending to provide commercial space transportation for NASA as well as for those private citizens with means and will to rise above the Earth's atmosphere for that rare glimpse at our home planet. NASA's Space Launch System (SLS) is the new protocol for the American Space Program. By sharing several decades' worth of essential and invaluable scientific data along with expertise and oversight, NASA is laying the foundation for a thriving aerospace industry and providing a great boost to our morale and economy. The SLS is an elaborate approach to lifting crew and cargo into the sky in a way that is safe, economical, and with greater options and flexibility. In this presentation you'll gain some insight into the future of space travel and understand why our traditional means of exploration are now history.

BAY AREA ASTRONOMY EVENTS

Kenneth Lum

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

BAY AREA REGULARLY SCHEDULED EVENTS

EVERY FRIDAY NIGHT **7:00 PM – 10:00 PM** **excluding major holidays** **The Telescope Makers' Workshop** **CHABOT SPACE AND SCIENCE CENTER** **10000 Skyline Boulevard** **Oakland, CA 94619-2450**	**THE TELESCOPE MAKERS' WORKSHOP** is held every Friday night from 7pm - 10pm, excluding major holidays (e.g. Christmas Day and New Year's Day) that fall on Fridays. The Workshop is always closed on Memorial Day Weekend. Attendance every Friday night is not mandatory, and members work at their own pace. The Workshop meets at Chabot Space & Science Center, 10000 Skyline Blvd., Oakland. Chabot's TMW is one of only a handful of regularly scheduled telescope making workshops in the U.S., and probably the world; it meets every Friday evening throughout the year, except Memorial Day weekend. It has been in operation since December of 1930, founded by Franklin B. Wright, and is currently run by Eastbay Astronomical Society member Rich Ozer, with help from other EAS members, Dave Barosso, Barry Leska, and others. The price of admission is FREE. All you have to do is show up, buy a mirror blank and a "tool" (typically around $100 - $200 depending on the size of the mirror) and start "pushin' glass!" We supply you with instruction, the various grits you'll need to first grind, and then polish and figure your mirror, and all the testing equipment needed. With a small bit of luck, you could wind up with a telescope that costs 1/3 or 1/4 the cost of a store-bought telescope, that is yet optically superior! Itdoes take time - depending on how much time you put in on it, and other factors, it could take a few months or several months. But, it's a fun project, great for kids, and at the end you get a great telescope! For more information call or email Richard Ozer at rozer@pacbell.net or phone (510) 406-1914.
EVERY FRIDAY & SATURDAY EVENING, weather permitting **7:30 PM – 10:30 PM** **CHABOT SPACE AND SCIENCE CENTER** **10000 Skyline Boulevard** **Oakland CA 94619-2450** **(510) 336-7300**	**EXPLORE THE NIGHT SKIES AT THE CHABOT OBSERVATORIES** For more information: http://www.chabotspace.org/ **Free Telescope Viewing** Regular hours are every Friday & Saturday evening, weather permitting: 7:30pm - 10:30pm Come for spectacular night sky viewing the best kept secret in the Bay Area and see the magnificence of our telescopes in action! **Daytime Telescope Viewing** On Saturday and Sunday afternoons come view the sun, moon, or Venus through Chabot's telescopes. Free with General Admission. (weather permitting) 12pm - 5pm: Observatories Open

Sunset – 5:11 PM **(TWICE MONTHLY)** **Inclement weather (clouds, excessive wind and showers) will cause the event to be canceled without notice.** **SAN MATEO COUNTY ASTRONOMICAL SOCIETY STAR PARTY**	**STAR PARTIES AT CRESTVIEW PARK, SAN CARLOS** Come out and bring the kids for a mind expanding look at the universe 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. For more information call Bob Black, **(650)592-2166**, or send an email to SMCAS@live.com or call Ed Pieret at **(650)862-9602.** **Reasons to Attend** 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. Cautions 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. Schedule Time Astronomers arrive to set up at around sunset. Observing starts at about one hour after sunset and continues for two to three hours.
EVERY CLEAR SATURDAY MORNING OBSERVATORY **10:00 AM – 12:00 PM** **FOOTHILL COMMUNITY COLLEGE** **12345 Moody Road** **Los Altos Hills** **Cost: Free**	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. 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.

EVERY CLEAR FRIDAY EVENING **9:00 PM – 11:00 PM** **FOOTHILL COMMUNITY COLLEGE OBSERVATORY** **12345 Moody Road** **Los Altos Hills** **Cost: Free**	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. 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. Come to Foothill Observatory and join us in the exploration of our Universe! 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.

For events commencing May 18 andbeyond:
http://tech.groups.yahoo.com/group/bayastro/?v=1&t=directory&ch=web&pub=groups&sec=dir&slk=94

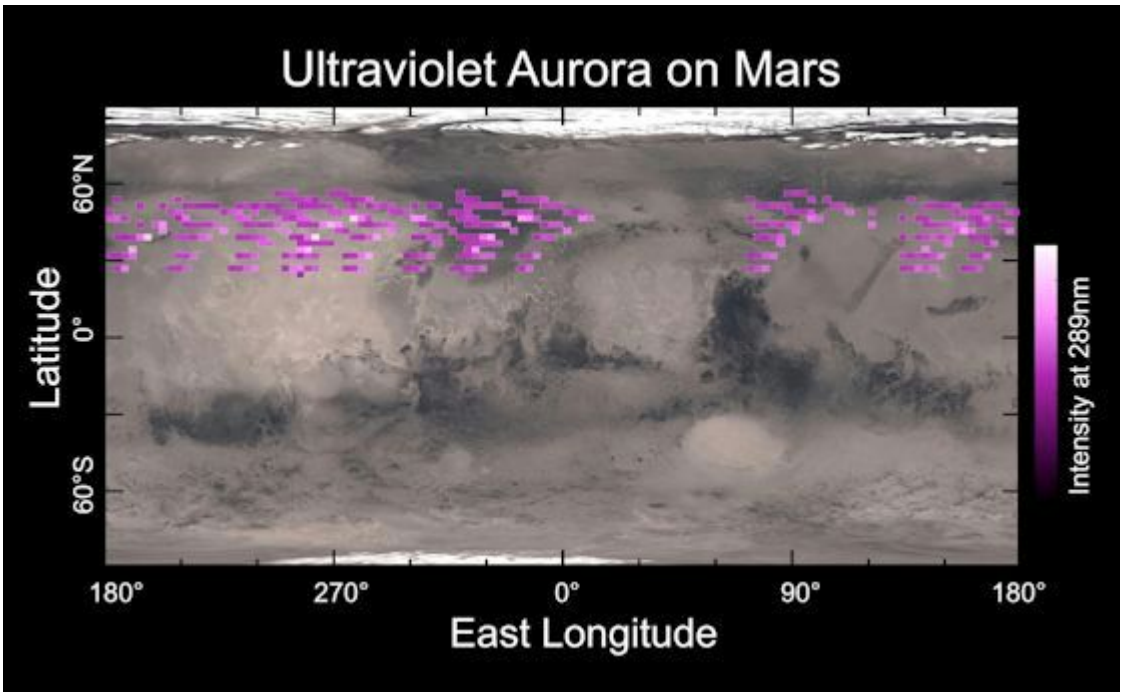
NASA SCIENCE NEWS

Auroras on Mars

May 11, 2015: One day, when humans go to Mars, they might find that, occasionally, the Red Planet has green skies.

In late Dec. 2014, NASA's MAVEN spacecraft detected evidence of widespread auroras in Mars's northern hemisphere. The "Christmas Lights," as researchers called them, circled the globe and descended so close to the Martian equator that, if the lights had occurred on Earth, they would have been over places like Florida and Texas.

"It really is amazing," says Nick Schneider who leads MAVEN's Imaging Ultraviolet Spectrograph (IUVS) instrument team at the University of Colorado. "Auroras on Mars appear to be more wide ranging than we ever imagined."



A map of MAVEN's Imaging Ultraviolet Spectrograph (IUVS) auroral detections in December 2014 overlaid on Mars' surface. The map shows that the aurora was widespread in the northern hemisphere, not tied to any geographic location. The aurora was detected in all observations during a 5-day period. Credits: University of Colorado.

This isn't the first time a spacecraft has detected auroras on Mars. Ten years ago, the European Space Agency's Mars Express found an ultraviolet glow coming from "magnetic umbrellas" in the southern hemisphere.

Unlike Earth, Mars does not have a global magnetic field that envelops the entire planet. Instead, Mars has umbrella-shaped magnetic fields that sprout out of the ground like mushrooms, here and there, but mainly in the southern hemisphere. These umbrellas are remnants of an ancient global field that decayed billions of years ago.

"The canopies of the patchwork umbrellas are where we expect to find Martian auroras," says Schneider. "But MAVEN is seeing them outside these umbrellas, so this is something new."

Auroras occur, both on Earth and Mars, when energetic particles from space rain down on the upper atmosphere. On Earth, these particles are guided toward the poles by our planet's global magnetic field. That's why auroras are seen most often around the Arctic and Antarctic. On Mars, there is no organized planetary magnetic field to guide the particles north and south—so they can go anywhere.

"The particles seem to precipitate into the atmosphere anywhere they want," says Schneider. "Magnetic fields in the solar wind drape across Mars, even into the atmosphere, and the charged particles just follow those field lines down into the atmosphere." According to the MAVEN data, solar particles that caused the "Christmas lights" penetrated deeply into the Martian atmosphere---sparking auroras less than 100 km from the surface. That's lower than auroras on Earth, which range from 100 km to 500 km high.

Like Mars Express 10 years ago, MAVEN has an ultraviolet camera, so it is not seeing the same thing as human eyes. What *would* a human see?

Schneider isn't certain. "We're still doing the physics," he says, "but we have some educated guesses."

Although the Martian atmosphere is primarily CO_2, it does contain some oxygen--and that is key to the color of the auroras. Excited oxygen atoms in the Martian atmosphere would likely produce green light.

"A diffuse green glow seems quite possible in the Mars sky, at least when the Sun is throwing off energetic particles," says Schneider.

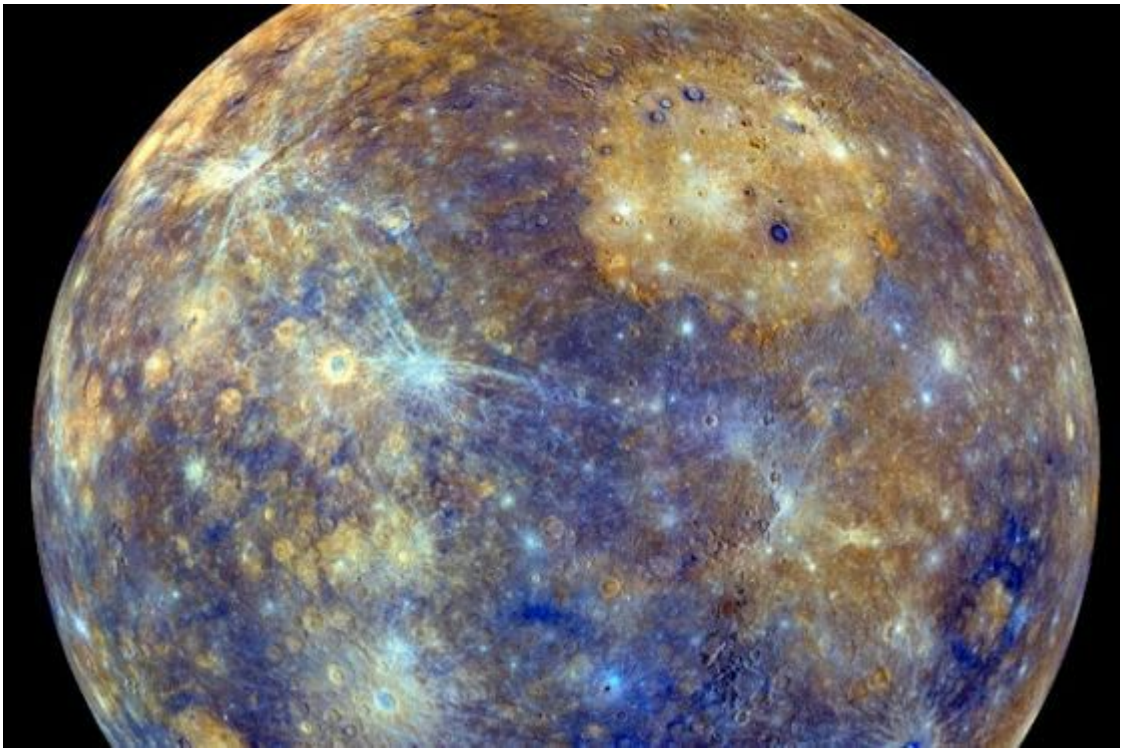
MAVEN arrived at Mars in September 2014 on a mission to investigate a planetary mystery: Billions of years ago, Mars was blanketed by layer of air massive enough to warm the planet and allow liquid water to flow on its surface. Life could have thrived in such an environment. Today, however, only a tiny fraction of that ancient air remains, leaving Mars a desiccated wasteland.
Where did the Martian atmosphere go? A favorite theory is solar wind erosion. Because Mars no longer has a global magnetic field to protect it, solar wind might strip away material from the upper layers of the atmosphere. Watching the auroras could help MAVEN mission scientists learn more about this process.

"Plus," says Schneider, who is looking forward to future data , "I just love auroras."

Credits: Author: Dr. Tony Phillips | Production editor: Dr. Tony Phillips | Credit: Science@NASA

Fire and Ice: A MESSENGER Recap

April 30, 2015: The planet closest to the Sun is, ironically, one of the coldest. That's just one of many mind-bending discoveries about Mercury that NASA's MESSENGER spacecraft beamed back to Earth over the past 7 years. Earlier today, the mission ended with a crash as spectacular as some of its findings.



The colors of the solar system's innermost planet are enhanced in this tantalizing view, based on global image data from the Mercury-orbiting MESSENGER spacecraft. More information

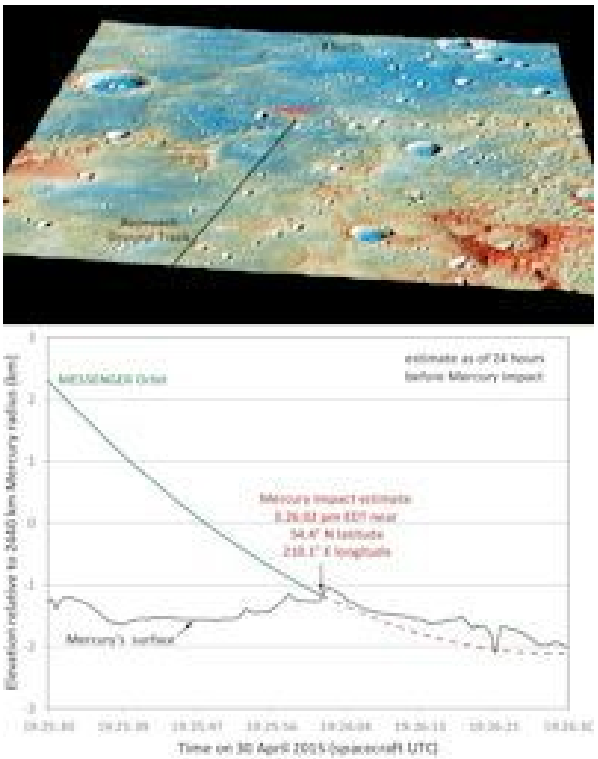
Mission controllers at the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland, have confirmed that MESSENGER slammed into the surface of Mercury on April 30th at 3:26 p.m. EDT. It had used the last of its propellant on April 24th and could no longer maintain a stable orbit. Traveling some 8,750 mph, the plummeting spacecraft made an unseen crater on the side of the planet facing away from Earth.

“Going out with a bang as it impacts the surface of Mercury, we are celebrating MESSENGER as more than a successful mission,” says John Grunsfeld, associate administrator for the Science Mission Directorate at NASA Headquarters in Washington. “Now, we begin the next phase of this mission--analyzing the exciting data already in the archives, and unravelling the mysteries of Mercury.”

Here are some of MESSENGER’s most important findings so far:

The hidden face of Mercury: In the mid-1970s when Mariner 10 flew past Mercury three times, the probe imaged less than half the planet. Until MESSENGER arrived, the rest of Mercury was a land of mystery. MESSENGER was the first spacecraft to view the entirety of the mighty Caloris basin—one of the biggest and youngest impact features in the solar system. Moreover, MESSENGER spotted volcanic vents around the rim of the basin, proving that volcanism—and not only impacts—have shaped the surface of the innermost planet.

The irony of Mercury’s poles: Mercury would seem to be an unlikely place to find ice. But the tilt of Mercury's rotational axis is almost zero - less than one degree - so the floors of craters at the planet's poles never see sunlight. Scientists suggested decades ago that there might be frozen water trapped there. The idea received a boost in 1991 when the Arecibo radio telescope in Puerto Rico and the Goldstone antenna in California detected unusually bright radar reflections from Mercury’s poles—the kind of reflections that ice would make. From Mercury orbit, MESSENGER was able to look down on Mercury’s poles like no other spacecraft or telescope, and it confirmed the unlikely: Permanently shadowed craters near Mercury’s poles have temperatures less than -280F (-173C), and water ice is stable on their dark inner surfaces. Some of the polar ice is covered by a mysterious dark organic material that researchers still do not understand.



These graphics show the predicted location and time of MESSENGER's impact on Mercury's surface. [details]

The incredible shrinking planet: The dominant tectonic landforms on Mercury are huge cliffs called “lobate scarps.” Even before MESSENGER, researchers thought these scarps were signs of global shrinkage, like wrinkles on a raisin. Why would Mercury shrink? The planet’s core makes up a whopping 60–70% of its mass. Cooling of this oversized core has led to a remarkable contraction of the planet. MESSENGER’s images of lobate scarps show that the total contraction is two to seven times greater than researchers previously thought.

Magnetically speaking, Mercury is alive: Until Mariner 10 discovered Mercury's magnetic field in the 1970s, Earth was the only other terrestrial planet known to have a global magnetic field. Earth's magnetism is generated by the planet's churning hot, liquid-iron core via a mechanism called a magnetic dynamo. Researchers have been puzzled by Mercury's field because its iron core was supposed to have finished cooling long ago and stopped generating magnetism. Some researchers thought that the field may have been a relic of the past, frozen in the outer crust. MESSENGER data show otherwise: Mercury's field appears to be generated by an active dynamo in the planet's core. It is not a relic.
A planet with a tail: Orbiting Mercury, MESSENGER made the first in situ observations of Mercury's unique exosphere. The exosphere is an ultrathin atmosphere where atoms and molecules are so far apart they are more likely to collide with the surface than with each other. This material is derived mainly from the surface of Mercury itself, knocked aloft by solar radiation, solar wind bombardment and meteoroid vaporization. MESSENGER was able to determine the chemical composition of the exosphere (hydrogen, helium, sodium, potassium, and calcium) and monitor the material as it was stretched out into a comet-like tail as long as 2 million km by the action of the solar wind. This tail, as well as Mercury’s magnetic field, was often buffeted by solar activity during MESSENGER’s long mission, giving the spacecraft a point-blank view of the roughest space weather in the solar system.

In addition to science discoveries, the mission provided many technological firsts, including the development of a ceramic cloth sunshade that protected the spacecraft's instruments and electronics from fierce solar radiation.

"The front side of the sunshade routinely experienced temperatures in excess of 300° Celsius (570° Fahrenheit), whereas the majority of components in its shadow routinely operated near room temperature (20°C or 68°F)," said Helene Winters, mission project manager at the Johns Hopkins University Applied Physics Laboratory (APL). "This technology to protect the spacecraft's instruments was a key to mission success during its prime and extended operations."
Goodbye, MESSENGER, and thanks!

Credits: Author: Dr. Tony Phillips | Production editor: Dr. Tony Phillips | Credit: Science@NASA

More information:

The spacecraft was designed and built by APL. The lab manages and operates the mission for NASA's Science Mission Directorate. The mission is part of NASA's Discovery Program, managed for the directorate by the agency's Marshall Space Flight Center in Huntsville, Alabama.
For a complete listing of science findings and technological achievements of the mission visit: http://www.nasa.gov/messenger

San Francisco Amateur Astronomers
PO Box 15097
San Francisco, CA 94115

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.