

★ ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

Vol. 60, No. 9 - September 2012

GENERAL MEETING

Wednesday, September 19, 2012

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 3rd Wednesday of each month (except January)



ANNE METEVIER, Ph.D.

MILKY WAY GALAXIES ACROSS THE UNIVERSE

The Universe contains many vast galaxies containing stars, gas, dust, and dark matter, just like our own Milky Way. In this talk, I will review the basic characteristics of different types of galaxies, note how the Milky Way fits in, and discuss how astronomers learn about the history of galaxies. I will show recent Hubble Space Telescope and ground-based observations of distant galaxies, and demonstrate how we use both images and spectra to trace the build-up of dark and luminous matter in galaxies like the Milky Way. Through studies like this, we can gain a better understanding of the way

in which galaxies have formed and evolved. In turn, we can also gain a better understanding of the formation and evolution of the Universe itself.

Anne Metevier is an astronomy educator who works to disseminate new research findings to students and the public, and to improve the way science and engineering subjects are taught. She is the lead instructor of a program on inquiry education that is run through the University of California, Santa Cruz, and the University of Hawai'i. She also works with the NASA Education/Public Outreach group at Sonoma State University, and she has taught physics and astronomy courses at Sonoma State, UC Santa Cruz, and Hartnell College. Anne received her Ph.D. in Astronomy and Astrophysics from UC Santa Cruz in 2003. She also worked there as an National Science Foundation Astronomy & Astrophysics Postdoctoral Fellow before moving to the North Bay.

PRESIDENT'S MESSAGE

Now that Summer's long days are getting shorter, there's more opportunity for stargazing, even as the evenings are getting cooler. We have a wonderful Fall viewing schedule which is kicked off on Tuesday September 18th at the Dominican University with their Big History Star Extravaganza.

We are fielding a great team of amateur astronomers who will lead the Dominican's first year students through a sky tour and telescope viewing.

Mt Tam Astronomy Program runs through October...so don't forget to join us up on the mountain to support the MTIA with public viewing after the lecture...while it lasts.

Hope to see you at Wednesday's Lecture at the Randall Museum!

SUE-ELLEN SPEIGHT
President
San Francisco Amateur Astronomers



San Francisco Amateur Astronomers

2012 Lecture Series

Upcoming Lectures

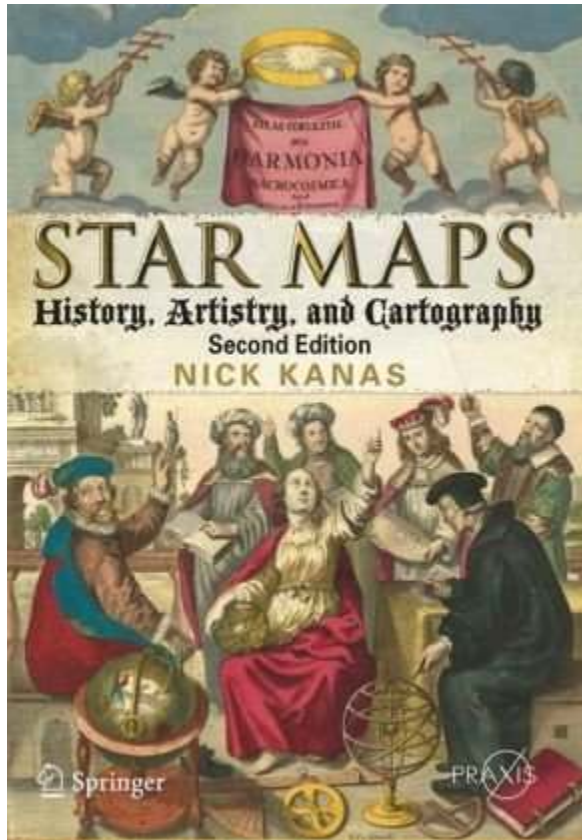
Randall Museum Theater . Randall Museum
199 Museum Way, San Francisco

7:30 p.m. . Free & Open to the Public

October 17 RITA WECHSLER, Department of Physics, Stanford University

**CONNECTING GALAXIES, HALOES, AND STAR FORMATION
ACROSS COSMIC TIME**

STAR MAPS
HISTORY, ARTISTRY, AND CARTOGRAPHY
Second Edition
By
NICK KANAS



Star Maps captures the beauty and awe of the heavens through celestial prints and star atlases. It traces the history of celestial cartography and relates this history to the changing ideas of humanity's place in the universe. The text of this Second Edition is enriched with 263 photographs, 91 in color, showing images from actual antiquarian celestial books and atlases, each one with an explanation of its astronomical and cartographic features.

This new edition of *Star Maps: History, Artistry, and Cartography* includes:

- over 50 new pages of text and 44 new images (16 in color)
- completely new sections on celestial frontispieces, deep-sky objects, playing card maps, additional cartographers, and modern computerized star maps
- updated figures and text about celestial globes, volvelles, telescopes, and planets and asteroids
- revised and updated text and illustrations throughout.
- glowing review of the 1st edition: "Lucky me. I just received *Star Maps* by Nick Kanas (Springer, 2007). This is one thorough and highly illustrated book! In addition to numerous black-and-white illustrations, three sections (totaling 76 pages) reproduces star

maps in color. Several appendices and a glossary round out this terrific book." (Michael Bakich, *Astronomy Magazine*, November 2007).

Star Maps focuses on the development of celestial cartography from ancient to modern times and describes the relationships between different star maps and atlases. It demonstrates contemporary cosmological ideas, constellation representations, and cartographic advances. Uniquely, it contains material on early American influences and non-European constellation representations.

About the Author

Dr. Kanas is an Emeritus Professor at the University of California, San Francisco, where for nearly 20 years he has conducted NASA-funded research on psychological issues affecting astronauts in space. He has received life science awards for his academic activities from the Aerospace Medical Association and the International Academy of Astronautics, and he is the co-author of the award-winning textbook *Space Psychology and Psychiatry* (2nd edition, Springer). He has been an amateur astronomer for nearly 55 years, and for over 30 years he has collected antiquarian celestial maps and books. He is a Fellow of the Royal Astronomical Society (London) and has written numerous articles and given talks on celestial cartography, including presentations at the Adler Planetarium; Lick, Mt. Wilson, and Greenwich (England) Observatories; and international conferences of the International Map Collectors Society.

INTERNATIONAL OBSERVE THE MOON NIGHT AT NASA AMES SEPT 22

Saturday evening, September 22, will mark International Observe the Moon Night (InOMN) for 2012. This annual occurrence is celebrated at many hundreds of events across the country and around the world. Here in the Bay Area, the NASA Lunar Science Institute will be hosting an InOMN event at NASA Ames Research Center. The event will feature public viewing of the Moon, live presentations by NASA researchers, and a demonstration of NASA's K10 robotic rover deploying a prototype polyimide antenna to simulate a possible future mission to the lunar far side to deploy a radio telescope. The Ames event will occur from 8PM to 11PM PDT. **Members of all Bay Area Astronomy clubs are invited to bring their telescopes to share views of the Moon with the public.** Visit <http://lunarscience.nasa.gov/astronomers/> to register your intent to attend and receive your free Astronomers' Pass which will give you and your car entrance to the observing area and access to the adjacent reserved astronomer parking areas. Telescopes will be set up on the parade ground in front of the NASA Lunar Science Institute. Enter at the Moffett Blvd gate off Hwy 101. Setup time for telescopes begins at 7PM. For more information of the Ames event, contact Brian Day at Brian.H.Day@nasa.gov. For more information on International Observe the Moon Night, visit <http://www.observethemoonnight.org/>.



Here in the Bay Area, the NASA Lunar Science Institute will be hosting an International Observe the Moon Night event at NASA Ames Research Center. The event will feature public viewing of the Moon, live presentations by NASA researchers, and a demonstration of NASA's K10 robotic rover deploying a prototype polyimide antenna to simulate a possible future mission to the lunar far side to deploy a radio telescope. The Ames event will occur from 8PM to 11PM PDT. Local amateur astronomers are invited to bring their telescopes to share views of the Moon with the public. Sign up here to register your intent to attend and receive your free Astronomers' Pass which will give you and your car entrance to the observing area and access to the adjacent reserved astronomer parking areas. Telescopes will be set up on the parade ground in front of the NASA Lunar Science Institute. Enter at the Moffett Blvd gate off Hwy 101. Setup time for telescopes begins at 7PM.

For more information of the Ames event, contact Brian Day at Brian.H.Day@nasa.gov.

For more information on International Observe the Moon Night, visit <http://www.observethemoonnight.org/>.

-NASA Scientists will deliver presentations throughout the night.

-A dedicated telescope viewing area will be available to view our nearest Celestial neighbor throughout the night.

-Gourmet Food Trucks available all night.

This event is free and open to all members of the public.

Lawn Chairs and Blankets are encouraged!

ASTRONOMERS: Please be sure to register and acquire the 'Astronomers' Ticket! We encourage you to bring your telescopes and equipment as we will have a dedicated area for viewing.

For more information on International Observe the Moon Night, visit <http://www.observethemoonnight.org/>.

<http://www.bayareascience.org/>

Bay Area Science Festival

October 27 – November 3



Supervisor Malia Cohen, Mayor Ed Lee, and School Board President Hydra Mendoza present a proclamation to UCSF Executive Vice Chancellor Jeff Bluestone at Discovery Days

Save the date for the 2012 festival – 10/27-11/3! We couldn't be more thrilled to be back for another year.

This year's festival will feature over 60 events across the Bay Area. Many of your favorites from last year will be back including:

- Bay Area Star Party
- Science Crawl
- Zombie Science NightLife
- [Discovery Days at AT&T Park](#)
- [Discovery Days North Bay at Sonoma County Fairgrounds](#)
- Passport to Science – our new day of science hikes, tours, and adventures
- Plus so many more!

We'll announce our full schedule in September, so stay tuned to this page for announcements. There are some incredibly special performances, hikes, and events planned for 2012 – we can't wait to see you there

October 25, 2012 at 7 PM
Free Public Lecture
USGS Menlo Park Campus

EXPLORING MARS WITH CURIOSITY
KEN HERKENHOFF

**- SEARCHING THE MARTIAN SURFACE FOR EVIDENCE OF
HABITABLE CONDITIONS**

USGS ASTROGEOLOGY SCIENCE CENTER
345 Middlefield Road, Menlo Park

- * The Mars Science Laboratory rover "Curiosity" landed successfully on August 5th to begin a 23 month mission
- * What have scientists discovered so far, particularly with respect to the geology of the Gale crater landing site?
- * Instruments aboard Curiosity are searching for evidence of environmental conditions that could support microbial life
- * How are dust and rocks analyzed and studied to learn about the role of water in forming the Martian landscape?

Part of the USGS Evening Public Lecture Series: <http://online.wr.usgs.gov/calendar>
Call 650-329-5000 for more information

Directions to U.S. Geological Survey Campus:

The USGS Menlo Park Science Center is located at 345 Middlefield Road in Menlo Park

From San Francisco

- Exit highway 101 at Marsh Road, Atherton
- Go west to the T-junction with Middlefield Rd.
- Turn left (south)

From San Jose

- Exit highway 101 at Willow Road, Menlo Park
- Go west to Middlefield Rd.
- Turn right (north)

Enter the USGS campus at Survey Lane with large stone markers labeled "U.S. Geological Survey"

Event Flyer: <http://online.wr.usgs.gov/calendar/2012/Oct12flyer.pdf>



**MT. TAMALPAIS STATE PARK
MT TAMALPAIS INTERPRETIVE ASSOCIATION**

2012 ASTRONOMY PROGRAMS -- OUR 24TH SEASON ON THE MOUNTAIN

The big scientific news has been the possible discovery of the long searched for Higgs Particle. But if you attended our June program, this was no surprise to you! Dr. Kuhlen of UC Berkeley "leaked" this announcement to our audience during his talk on *"The Milky Way As Dark Matter."* Be sure to stay informed of new developments in astronomy and physics by attending our series. Our speakers are active researchers at the top of their fields who share their latest results with you. Immediately following each month's lecture, the audience is invited to remain in the Mountain Theater for a brief Night Sky Tour by the Urban Astronomer, highlighting the prominent constellations, stars and planets visible in the night time sky, before enjoying the observing session (star party) conducted by the San Francisco Amateur Astronomers in the Rock Springs parking lot.

All programs are FREE, open to all, and sponsored by your State Park. Please dress appropriately (it can get cold), bring a flashlight and car pool if possible. If the weather is iffy on the program date, check our **hot line, 415-455-5370**. The message is updated about 3:00pm IF there is any change in the schedule. Note that while observing is affected by clouds, the fog usually does not reach our observing area and generally dissipates after sundown. Lectures are cancelled only in cases of rain or if fire danger closes the park.

You can find more information and a listing of the entire season (April through Oct) on our website: www.mttam.net/astronomy. Follow us on Facebook.

Thanks for informing others of our programs. See you on the Mountain - and bring a friend!

Sept 22
7:30pm

Dr. Seth Shostak, Senior Astronomer SETI Institute
"What Happens if We Find ET?"

Searches for signals from intelligent extraterrestrials are getting better as technology improves. So a signal might be discovered in your lifetime. But then what? Would you be told, and would it be dangerous?

Oct 20
7:00pm

Dr. Chris McKay NASA-Ames Research Center
"MSL and the search for organics on Mars"

NASA's Mars Science Laboratory will arrive on the red planet in August. How can the mission's rover, Curiosity, with unprecedented research tools to study the early environmental history of Mars, contribute to the search for evidence of life on Mars

NIGHT SKY NETWORK

SEPTEMBER 2012 - THE EVENING SKY

May Sky Map: <http://skymaps.com/skymaps/tesmn1209.pdf>

May Sky Calendar: <http://skymaps.com/articles/n1209.html>

Sunday, 09/16/12
02:00 PM

The Tech Museum of Innovation
201 South Market St
San Jose, CA 95113

The Physics of Animation
Computer animation in feature-films is a modern-day nexus of art and science.

Professor Alejandro Garcia developed and teaches "Physics of Animation", a science course for visual artists. During 2011, he took a professional leave and worked in Dreamworks Animation's department of Artistic Development as a physics consultant on "Madagascar 3: Europe's Most Wanted."
Hear Professor Garcia discuss the animation industry from both the scientific and artistic perspectives.

Speaker: Alejandro Garcia

Contact:

Website: <http://www.thetech.org/programs/lecture-series>

Cost:

\$10 General, \$5 Members

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Sunday, 09/16/12
11:00 AM - 05:00 PM

California Academy of Sciences
55 Music Concourse Dr.
San Francisco, CA 94118

Free Sunday at the California Academy of Sciences
Museum Free Days

Free Day Changes

The Academy is changing its free day policy to target more working families, who were previously unable to come on the Wednesday free days. We hope that this change to weekend dates will allow a wider range of people to attend.

Starting in 2012, the Academy's monthly Free Wednesday will be replaced with a quarterly Free Sunday.

The free days for 2012 will be:

- September 16, 2012
- December 9, 2012

Website: <http://calacademy.org/>

NASA SCIENCE CAST

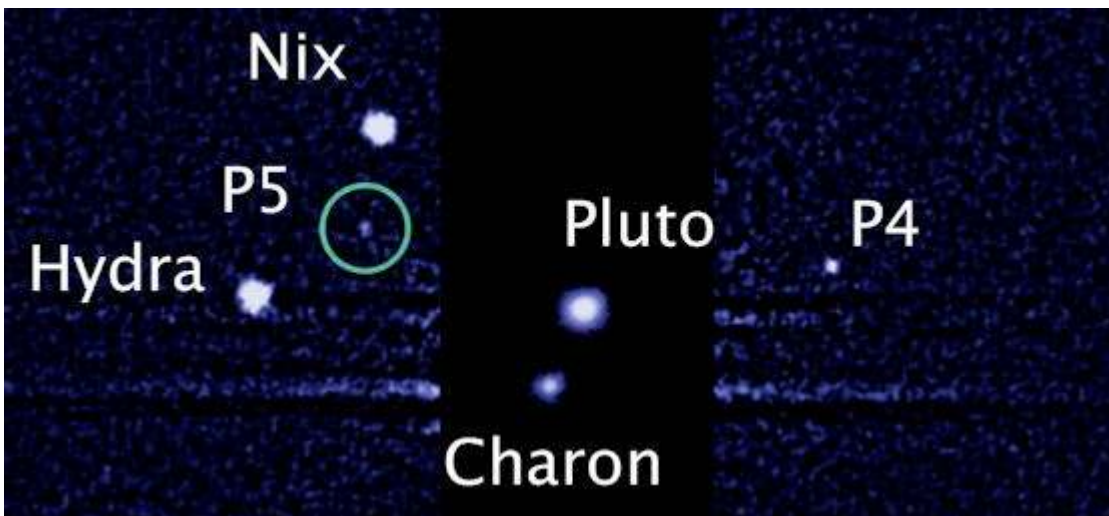
Every week, we produce a short video highlighting a topic in NASA science news. A complete list of ScienceCast episodes may be found on Science@NASA's Youtube channel: <http://www.youtube.com/user/ScienceAtNASA> . Enjoy!

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

Fifth Moon Discovered Around Pluto

July 13, 2012: A team of astronomers using NASA's Hubble Space Telescope has discovered another moon orbiting the dwarf planet Pluto.

They say the new moon, Pluto's 5th, is likely irregular in shape and 6 to 15 miles across. Provisionally designated S/2012 (134340) 1, it was detected in nine separate sets of images taken by Hubble's Wide Field Camera 3 on June 26, 27, 29, and July 7 and 9. The moon circles Pluto in a 58,000 mile-diameter orbit.



This image, taken by NASA's Hubble Space Telescope, shows five moons orbiting the distant, icy dwarf planet Pluto. The green circle marks the newly discovered moon, designated P5, as photographed by Hubble's Wide Field Camera 3 on July 7. The observations will help scientists in their planning for the July 2015 flyby of Pluto by NASA's New Horizons spacecraft. P4 was uncovered in Hubble imagery in 2011.

(Credit: NASA; ESA; M. Showalter, SETI Institute)

"The moons form a series of neatly nested orbits, a bit like Russian dolls," notes team leader Mark Showalter of the SETI Institute in Mountain View, Calif.

The Pluto team is intrigued that such a small planet can have such a complex collection of satellites. The new discovery provides additional clues for unraveling how the Pluto system formed and evolved. The favored theory is that all the moons are relics of a collision between Pluto and another large Kuiper Belt object billions of years ago. (The Kuiper Belt is a broad zone of icy Pluto-like bodies orbiting beyond Neptune. Pluto itself is considered to be a Kuiper Belt object.)



The new detection will help scientists navigate NASA's New Horizons spacecraft through the Pluto system in 2015, when it makes an historic and long-awaited high-speed flyby of the distant world.

A ScienceCast video previews New Horizons visit to Pluto in 2015. [Play it](#)

The team is using Hubble to scour the Pluto system to uncover potential hazards to New Horizons. Moving past the dwarf planet at a speed of 30,000 miles per hour, the spacecraft could be destroyed in a collision with even a BB-shot-size piece of orbital debris.

“The discovery of so many small moons indirectly tells us that there must be lots of small particles lurking unseen in the Pluto system,” says Harold Weaver of the Johns Hopkins University Applied Physics Laboratory in Laurel, Md.

“The inventory of the Pluto system we’re taking now with Hubble will help the New Horizons team design a safer trajectory for the spacecraft,” adds Alan Stern of the Southwest Research Institute in Boulder, Colo., the mission’s principal investigator.

Pluto’s largest moon, Charon, was discovered in 1978 in observations made at the United States Naval Observatory in Washington, D.C. Hubble observations in 2006 uncovered two additional small moons, Nix and Hydra. In 2011 another moon, P4, was found in Hubble data.

In the years following the New Horizons Pluto flyby, astronomers plan to use Hubble’s planned successor, NASA’s James Webb Space Telescope, for follow-up observations. The Webb telescope’s infrared vision will be able to measure the surface chemistry of Pluto, its moons, and many other bodies that lie in the distant Kuiper Belt along with Pluto.

For more information about New Horizons and its mission to Pluto visit <http://pluto.jhuapl.edu/>

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

More Information

[Dwarf Planet Mysteries Beckon to New Horizons](#) -- Science@NASA

[New Horizons Becomes Closest Spacecraft to Pluto](#) -- Science@NASA

[Visit to Pluto](#) -- NASA ScienceCast video

The Pluto Team members are M. Showalter (SETI Institute), H.A. Weaver (Applied Physics Laboratory, Johns Hopkins University), and S.A. Stern, A.J. Steffl, and M.W. Buie (Southwest Research Institute). -- Science@NASA

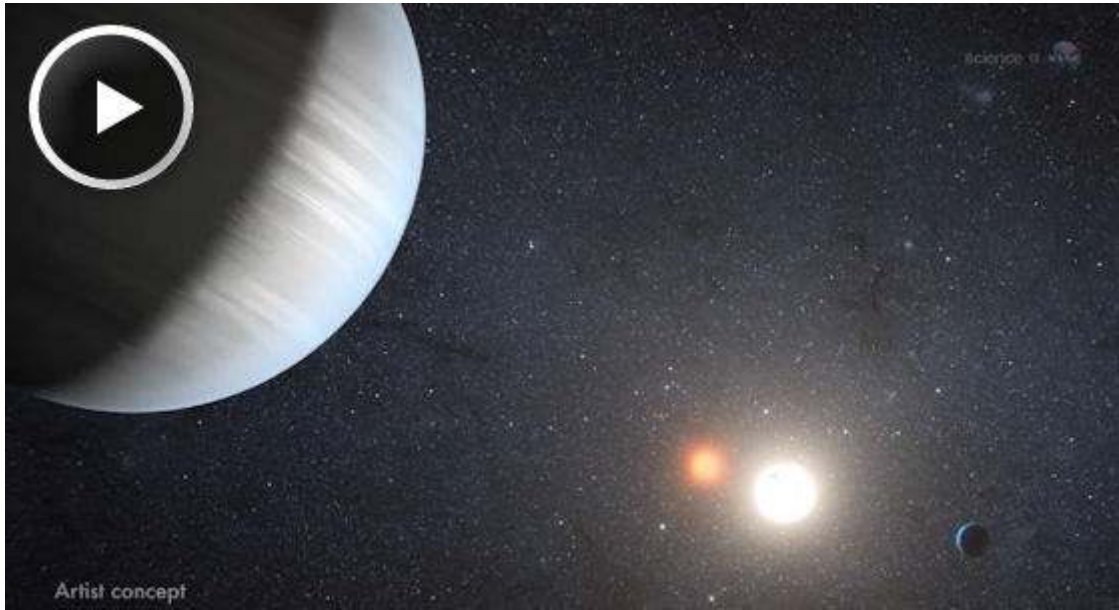
The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency. NASA’s Goddard Space Flight Center in Greenbelt, Md., manages the telescope. The Space Telescope Science Institute (STScI) in Baltimore conducts Hubble science operations. STScI is operated for NASA by the Association of Universities for Research in Astronomy, Inc., in Washington, D.C.

Weird Planets

Sept. 12, 2012: **News flash: The Milky Way galaxy just got a little weirder.**

Back in 2011 astronomers were amazed when NASA’s Kepler spacecraft discovered a planet orbiting a double star system. Such a world, they realized, would have double sunsets and sunrises just like the fictional planet Tatooine in the movie Star Wars. Yet this planet was real.

Now Kepler has discovered a whole system of planets orbiting a double star.



A new ScienceCast video takes viewers on a tour through the Kepler-47 system. [Play it](#)

The star system, known as Kepler-47, is located 4,900 light-years from Earth in the constellation Cygnus. Two stars orbit one another at the center of the system: One is similar to the sun in size, but only 84 percent as bright. The second star is smaller, only one-third the size of the sun and less than 1 percent as bright. Kepler found two planets orbiting this mismatched pair.

"The presence of a full-fledged planetary system orbiting Kepler-47 is an amazing discovery," says Greg Laughlin, professor of Astrophysics and Planetary Science at the University of California in Santa Cruz. "This is going to change the way we think about the formation of planets."



The inner planet, Kepler-47b, closely circles the pair of stars, completing each orbit in less than 50 days. Astronomers think it is a sweltering world, where the destruction of methane in its super-heated atmosphere might lead to a thick global haze. Kepler-47b is about three times the size of Earth.

The outer planet, Kepler-47c, orbits every 303 days. This puts it in the system's habitable zone, a band of orbits that are "just right" for liquid water to exist on the surface of a planet. But does this planet even have a surface? Possibly not. The astronomers think it is a gas giant slightly larger than Neptune.

The discovery of planets orbiting double stars means that planetary systems are even weirder and more abundant than previously thought.



This diagram compares our own solar system to Kepler-47, a double-star system containing two planets, one orbiting in the so-called "habitable zone." Credit: NASA/JPL-Caltech/T. Pyle [more](#)

"Many stars are part of multiple-star systems where two or more stars orbit one another. The question always has been -- do they have planets and planetary systems?" says William Borucki, Kepler mission principal investigator at NASA's Ames Research Center. "This Kepler discovery proves that they do."

Our own sun is a single, isolated star, with a relatively simple gravitational field that rules the motions of the planets orbiting it.

But, as Borucki points out, not all stars are single. Astronomers estimate that more than half of the stars in the galaxy have companions. There are double, triple and even quadruple star systems. Any planets in such systems would have to navigate a complex gravitational field, tugged in multiple directions by multiple stars. In fact, for many years, astronomers doubted that planets could even form in such an environment.

Kepler-47 erases those doubts—and poses a conundrum: "These planets are very difficult to form using the currently accepted paradigm," says Laughlin. "I believe that theorists, myself included, will be going back to the drawing board to try to improve our understanding of how planets are assembled in the dusty gaseous disks that surround many young stars."

The Kepler spacecraft is on a mission to find Earth-like planets that might support life. Says Borucki: "In our search for habitable worlds, we have just found more opportunities for life to exist."

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

Wide Awake in the Sea of Tranquility

Neil Armstrong was supposed to be asleep. The moonwalking was done. The moon rocks were stowed away. His ship was ready for departure. In just a few hours, the Eagle's ascent module would blast off the Moon, something no ship had ever done before, and Neil needed his wits about him. He curled up on the Eagle's engine cover and closed his eyes.

But he could not sleep.

Neither could Buzz Aldrin. In the cramped lander, Buzz had the sweet spot, the floor. He stretched out as much as he could in his spacesuit and closed his eyes. Nothing happened. On a day like this, sleep was out of the question.



Above: Apollo 11 Earthrise. [\[More\]](#)

July 20, 1969: The day began on the farside of the Moon. Armstrong, Aldrin and crewmate Mike Collins flew their spaceship 60 miles above the cratered wasteland. No one on Earth can see the Moon's farside. Even today it remains a land of considerable mystery, but the astronauts had no time for sight-seeing. Collins pressed a button, activating a set of springs, and the spaceship split in two. The half named Columbia, with Collins on board, would remain in orbit. The other half, the Eagle, spiraled over the horizon toward the Sea of Tranquility.

"You are Go for powered descent," Houston radioed, and the Eagle's engine fired mightily. The bug-shaped Eagle was so fragile a child could poke a hole through its gold foil exterior. Jagged moonrocks could do much worse. So when Armstrong saw where the computer was guiding them--into a boulder field--he quickly took control. The Eagle pitched forward and sailed over the rocks.

Meanwhile, alarms were ringing in the background.

"Program alarm," announced Armstrong. "It's a 1202." The code was so obscure, almost no one knew what it meant. Should they abort? Should they land? "What is it?" he insisted.

Scrambling back in Houston, a young engineer named Steve Bales produced the answer: The radar guidance system was pestering the computer with too many interruptions. No problem. "We've got you..." radioed Houston. "We're Go on that alarm."

And on they went. Things, however, were not going exactly as planned. The Sea of Tranquillity was supposed to be smooth, but it didn't look so smooth from the cockpit of the Eagle. Armstrong scanned the jumbled mare for a safe place to land. "60 seconds," radioed Houston. "30 seconds." Mission control was hushed as the telemetry came in. Soon, too soon, the ship would run out of fuel.

Right: Mission Control during the Apollo 11 descent. [\[More\]](#)

Capcom later claimed the "boys in mission control were turning blue" when Armstrong announced "I [found] a good spot." As for Armstrong, his heart was thumping 156 beats per minute according to bio-sensors. The fuel gauge read only 5.6% when the Eagle finally settled onto the floor of the Sea of Tranquillity.

Houston (relieved): "We copy you down, Eagle."

Armstrong (coolly): "Houston, Tranquility Base here. The Eagle has landed."



Immediately, they prepared to leave. This was NASA being cautious. No one had ever landed on the Moon before. What if a footpad started sinking into the moon dust, or the Eagle sprung a leak? While Neil and Buzz made ready to blast off, Houston read the telemetry looking for signs of trouble. There were none, and three hours after touchdown, finally, Houston gave the "okay." The moonwalk was on!

At 9:56 p.m. EDT, Neil descended the ladder and took "one small step" (left foot first) into history. From the shadow of the Eagle, he looked around: "It has a stark beauty all its own--like the high desert of the United States." Houston reminded him to gather the "contingency sample," and Neil put some rocks and soil in his pocket. If, for any reason, the astronauts had to take off in a hurry, scientists back on Earth would get at least a pocketful of the Moon for their experiments.

Soon, Buzz joined him. "Beautiful view!" he exclaimed when he reached the lander's broad footpad. "Isn't that something!" agreed Armstrong. "Magnificent sight out here."

"Magnificent desolation," said Aldrin.

Those two words summed up the yin-yang of the Moon. The impact craters, the toppled boulders, the layers of moon dust--it was utterly alien. Yet Tranquillity Base felt curiously familiar, like home. Later Apollo astronauts had similar feelings. Maybe this comes from staring at the Moon so often from Earth. Or maybe it's because the Moon is a piece of Earth, spun off our young planet billions of years ago. No one knows; it just is.



Above: Buzz Aldrin and the Eagle. [\[In stereo\]](#)

Truly, much of the scene was weird. The airless landscape jumped out at the astronauts with disconcerting clarity and, as a result, the horizon felt unnaturally close. Worse yet, the whole world seemed to curve, a side-effect of the Moon's short thousand-mile radius. "Distances [here] are deceiving," noted Aldrin.

The sky was equally baffling. Although the Eagle had landed on a bright lunar morning, the sky was as black as midnight. An astronomer's paradise? No. Not a single star was visible. The glaring, sunlit ground ruined the astronaut's night vision. Only Earth itself was bright enough to be seen, luminous blue and white, hanging overhead.

Armstrong was particularly fascinated by moondust, which he kicked and scuffed with his boots. On Earth, kicking dust makes a little cloud in the air--but there is no air on the Moon. "When you kick the surface, [the dust goes out in] a little fan which, to me, is in the shape of a rose petal," recalls Armstrong. "There's just a little ring of particles--nothing behind 'em--no dust, no swirl, no nothing. It's really unique."

Enough of that. It was time for work.

Almost forgotten in Apollo lore are the [checklists](#) sewn to the forearms of the spacesuits. These "honey-do" memos from NASA were jam-packed with activities--from inspecting the lander to deploying the TV to collecting samples. Some of the tasks were as detailed as bending over and reporting to Mission Control how it went. They had a lot to do.

Neil and Buzz deployed a solar wind collector, a seismometer and a laser retroreflector. They erected a flag and uncovered a plaque proclaiming, "We came in peace for all mankind." They took the first interplanetary phone call--"I just can't tell you how proud we all are," said President Nixon from the Oval Office. They



collected 47 lbs of moon rocks and took 166 pictures. Check. Check. Check.

Right: Buzz Aldrin totes experiments from the Eagle onto the lunar surface. [\[More\]](#)

Finally, after two and a half busy, exhilarating hours, it was time to go. The checklist continued: Climb back in the Eagle. Stow the rocks. Prepare the ship for departure (again). Eat dinner: Beef stew or cream of chicken soup. And finally, sleep.

That was the limit. "You just are not going to get any sleep while you're waiting [for liftoff]," Aldrin said after the mission.

The Eagle was not a sleepy place. The tiny cabin was noisy with pumps and bright with warning lights that couldn't be dimmed. Even the window shades were glowing, illuminated by intense sunshine outside. "After I got into my sleep stage and all settled down, I realized there was something else [bothering me]," said Armstrong. The Eagle had an optical telescope sticking out periscope-style. "Earth was shining right through the telescope into my eye. It was like a light bulb."

To get some relief, they closed the helmets of their spacesuits. It was quiet inside and they "wouldn't be breathing all the dust" they had tramped in after the moon walk, said Aldrin. Alas, it didn't work. The suit's cooling systems, so necessary out on the scorching lunar surface, were too cold for sleeping inside the Eagle. The best Aldrin managed was a "couple hours of mentally fitful drowsing." Armstrong simply stayed awake.

When the wake-up call finally came,

"Tranquility Base, Tranquility Base, Houston. Over."

Armstrong answered with alacrity,

"Good morning, Houston. Tranquility Base. Over."

It was time to go home for a good night's sleep.

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

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.

Sharing the Wonders of the Universe

Web Page: www.sfaa-astronomy.org

Information Hotline: (415) 289-6636



San Francisco Amateur Astronomers
P.O. Box 15097
San Francisco, CA 94115

MEMBERSHIP APPLICATION

Membership is billed for each upcoming year on June 30. Between January 1 and June 30, new members pay one half the amount listed below

Membership Categories (Check one):
 \$10 Youth/Student \$40 Institutional
 \$25 Individual \$75 Supporting
 \$30 Family

Information: Name(s) _____
Address _____
City _____
State _____ Zip _____
Home Phone _____
E-Mail _____

You can choose E-Mail (Recommended) or hard copy delivery for *Above the Fog* (Check one)

E-Mail Hard Copy

Please make checks payable to San Francisco Amateur Astronomers and mail to:

San Francisco Amateur Astronomers
POB 15097
San Francisco CA 94115