

Space News Update

– September 5, 2017 –

Contents

In the News

Story 1:

Soyuz Brings Peggy Whitson Home after Record-Setting Mission

Story 2:

Discovery of Boron on Mars Adds to Evidence for Habitability

Story 3:

'Extreme' Telescopes Find the Second-Fastest-Spinning Pulsar

Departments

The Night Sky

ISS Sighting Opportunities

Space Calendar

NASA-TV Highlights

Food for Thought

Space Image of the Week

1. Soyuz Brings Peggy Whitson Home after Record-Setting Mission



Wrapping up a record-setting flight, Peggy Whitson, America's most experienced astronaut with nearly two years of time in orbit across three missions, returned to Earth Saturday after a 288-day stay aboard the International Space Station, landing on the steppe of Kazakhstan with Soyuz MS-04 commander Fyodor Yurchikhin and flight engineer Jack Fischer.

Descending gently under a billowing orange-and-white parachute, the Soyuz crew module, scorched after a fiery high-speed plunge back into the atmosphere, settled to a jarring rocket-assisted touchdown near the town of Dzezkazgan at 9:21 p.m. EDT (GMT-4; 7:21 a.m. Sunday local time).

Russian recovery crews quickly reached the spacecraft to help the returning crew members out of the cramped descent module as they begin their re-adjustment to the unfamiliar tug of gravity.

Yurchikhin, Fischer and Whitson were carried one at a time to nearby recliners for quick medical checks and brief satellite phone calls home to family and friends. All three appeared relaxed and in good health, smiling and chatting with support crews under a clear morning sky.

After a more detailed round of medical checks in a nearby inflatable tent, all three crew members were to be flown by helicopter to Karaganda where Yurchikhin will board a Russian space agency plane for the trip home to Star City near Moscow.

Because of the catastrophic flooding caused by Hurricane Harvey, the NASA Gulfstream jet that normally would have met Fischer and Whitson in Karaganda was delayed. Stepping in to help out, the European Space Agency volunteered to fly the U.S. astronauts to Cologne, Germany, where the NASA jet will meet them for the long flight back to storm-ravaged Houston.

"It was just one week ago when Hurricane Harvey's weather started to be felt on Texas shores," astronaut Randy Bresnik said during a change-of-command ceremony aboard the station Friday. "Since then, there's been historic rainfall that they say Houston hasn't seen in a millennium.

"During that time, the Johnson Space Center-NASA team showed incredible dedication and fortitude to ... make sure we could be safe up here, work up here, while they monitored and controlled this space station for us. We will do our utmost to show the same dedication and fortitude every single day that you guys exemplified every single day."

If all goes well, Fischer and Whitson, along with scientific samples brought down from the station, will get back to the Johnson Space Center Sunday night.

Whitson's return will close out a remarkable chapter in a storied career, one that is unlikely to be matched at NASA before astronauts return to the moon or venture on to Mars.

Launched last Nov. 17 aboard the Soyuz MS-03 spacecraft, Whitson logged 288 days in space during her third, extended mission while Yurchikhin and Fischer logged 136 days.

Whitson's total time in space over three visits to the space station now stands at 665 days 22 hours and 23 minutes, 131 days more than her closest NASA competitor, moving her up to eighth in the world on the list of most experienced astronauts and cosmonauts. Yurchikhin ranks seventh with 673 days aloft over five missions.

A former chief astronaut who twice served as the space station's commander, Whitson, who holds a Ph.D. in biochemistry, is also the world's most experienced female spacewalker with 60 hours and 21 minutes of EVA time over 10 excursions. She stands third in the world in spacewalk experience while Yurchikhin ranks fourth.

Source: [Spaceflight Now](#)

[Return to Contents](#)

2. Discovery of Boron on Mars Adds to Evidence for Habitability



Los Alamos, N.M., September 5, 2017 - The discovery of boron on Mars gives scientists more clues about whether life could have ever existed on the planet, according to a paper published today in the journal *Geophysical Research Letters*.

"Because borates may play an important role in making RNA--one of the building blocks of life--finding boron on Mars further opens the possibility that life could have once arisen on the planet," said Patrick Gasda, a postdoctoral researcher at Los Alamos National Laboratory and lead author on the paper. "Borates are one possible bridge from simple organic molecules to RNA. Without RNA, you have no life. The presence of boron tells us that, if organics were present on Mars, these chemical reactions could have occurred."

RNA (ribonucleic acid) is a nucleic acid present in all modern life, but scientists have long hypothesized an "RNA World," where the first proto-life was made of individual RNA strands that both contained genetic information and could copy itself. A key ingredient of RNA is a sugar called ribose. But sugars are notoriously unstable; they decompose quickly in water. The ribose would need another element there to stabilize it. That's where boron comes in. When boron is dissolved in water--becoming borate--it will react with the ribose and stabilize it for long enough to make RNA. "We detected borates in a crater on Mars that's 3.8 billion years old, younger than the likely formation of life on Earth," said Gasda. "Essentially, this tells us that the conditions from which life could have potentially grown may have existed on ancient Mars, independent from Earth."

The boron found on Mars was discovered in calcium sulfate mineral veins, meaning the boron was present in Mars groundwater, and provides another indication that some of the groundwater in Gale Crater was habitable, ranging between 0-60 degrees Celsius (32-140 degrees Fahrenheit) and with neutral-to-alkaline pH.

The boron was identified by the rover's laser-shooting ChemCam (Chemistry and Camera) instrument, which was developed at Los Alamos National Laboratory in conjunction with the French space agency. Los Alamos' work on discovery-driven instruments like ChemCam stems from the Laboratory's experience building and operating more than 500 spacecraft instruments for national defense.

The discovery of boron is only one of several recent findings related to the composition of Martian rocks. Curiosity is climbing a layered Martian mountain and finding chemical evidence of how ancient lakes and wet underground environments changed, billions of years ago, in ways that affected their potential favorability for microbial life.

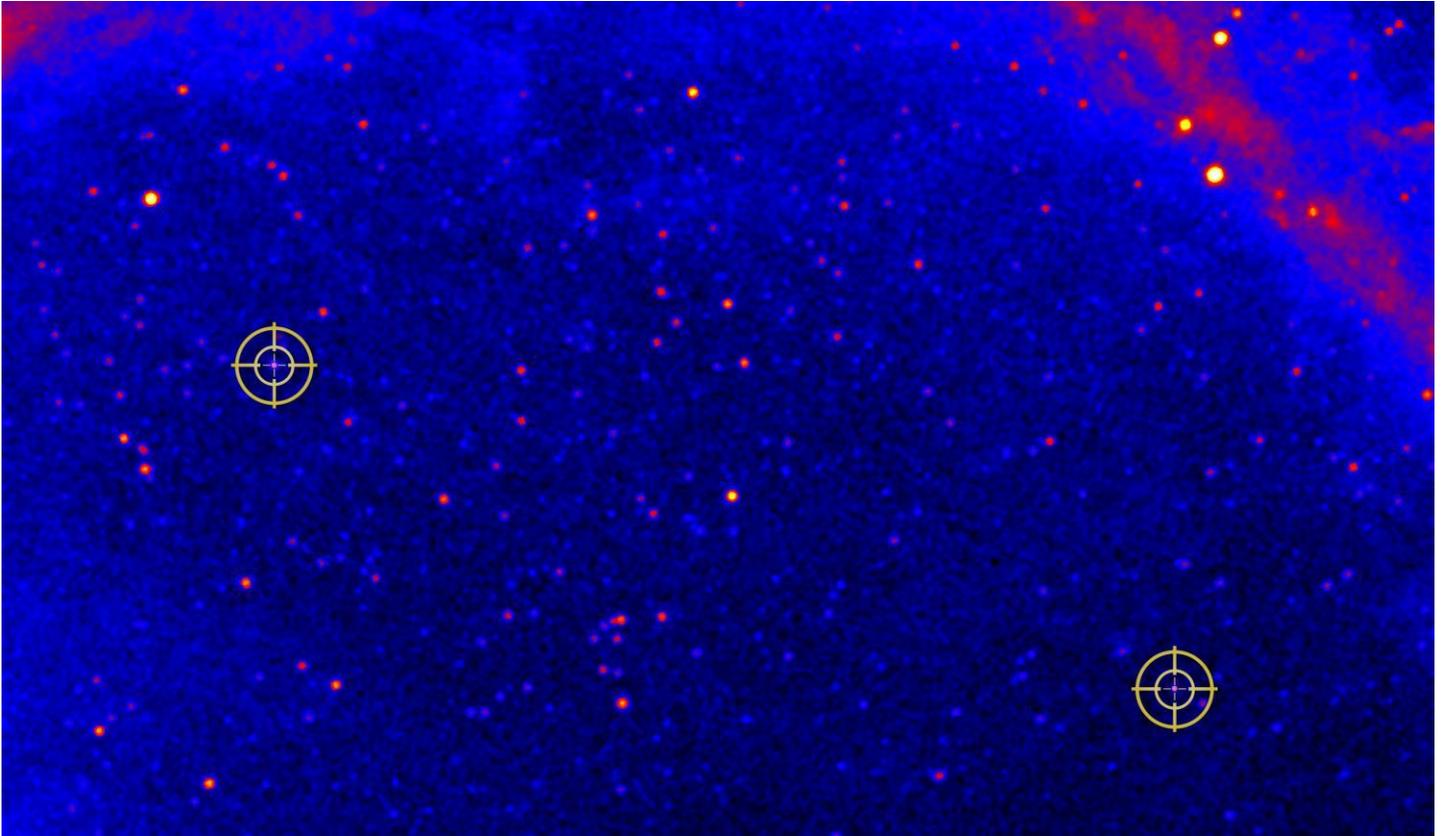
As the rover has progressed uphill, compositions trend toward more clay and more boron. These and other chemical variations can tell us about conditions under which sediments were initially deposited and about how later groundwater moving through the accumulated layers altered and transported dissolved elements, including boron.

Whether Martian life has ever existed is still unknown. No compelling evidence for it has been found. When Curiosity landed in Mars' Gale Crater in 2012 the mission's main goal was to determine whether the area ever offered a habitable environment, which has since been confirmed. The Mars 2020 rover will be equipped with an instrument called "SuperCam," developed by Los Alamos and an instrument called SHERLOC, which was developed by the Jet Propulsion Laboratory with significant participation by Los Alamos. Both of these will search for signs of past life on the planet.

Source: [EurekAlert](#)

[Return to Contents](#)

3. 'Extreme' Telescopes Find the Second-Fastest-Spinning Pulsar



By following up on mysterious high-energy sources mapped out by NASA's Fermi Gamma-ray Space Telescope, the Netherlands-based Low Frequency Array (LOFAR) radio telescope has identified a pulsar spinning at more than 42,000 revolutions per minute, making it the second-fastest known.

A [pulsar](#) is the core of a massive star that exploded as a supernova. In this stellar remnant, also called a neutron star, the equivalent mass of half a million Earths is crushed into a magnetized, spinning ball no larger than Washington, D.C. The rotating magnetic field powers beams of radio waves, visible light, X-rays and gamma rays. If a beam happens to sweep across Earth, astronomers observe regular pulses of emission and classify the object as a pulsar.

"Roughly a third of the gamma-ray sources found by Fermi have not been detected at other wavelengths," said Elizabeth Ferrara, a member of the discovery team at NASA's Goddard Space Center in Greenbelt, Maryland. "Many of these unassociated sources may be pulsars, but we often need follow-up from radio observatories to detect the pulses and prove it. There's a real synergy across the extreme ends of the electromagnetic spectrum in hunting for them."

The new object, named PSR J0952-0607—or J0952 for short—is classified as a millisecond pulsar and is located between 3,200 and 5,700 light-years away in the constellation Sextans. The pulsar contains about 1.4 times the sun's mass and is orbited every 6.4 hours by a companion star that has been whittled away to less than 20 times the mass of the planet Jupiter. The scientists report their findings in a paper published in the Sept. 10 issue of *The Astrophysical Journal Letters* and now available [online](#).

At some point in this system's history, matter began streaming from the companion and onto the pulsar, gradually raising its spin to 707 rotations a second, or more than 42,000 rpm, and greatly increasing its emissions. Eventually, the pulsar began evaporating its companion, and this process continues today. Because of their similarity to spiders that consume their mates, systems like J0952 are called black widow or redback

pulsars, depending on how much of the companion star remains. Most of the known systems of these types were found by following up Fermi unassociated sources.

The LOFAR discovery also hints at the potential to find a new population of ultra-fast pulsars.

"LOFAR picked up pulses from J0952 at radio frequencies around 135 MHz, which is about 45 percent lower than the lowest frequencies of conventional radio searches," said lead author Cees Bassa at the Netherlands Institute for Radio Astronomy (ASTRON). "We found that J0952 has a steep radio spectrum, which means its radio pulses fade out very quickly at higher frequencies. It would have been a challenge to find it without LOFAR."

Theorists say pulsars could rotate as fast as 72,000 rpm before breaking apart, yet the fastest spin known—by PSR J1748-2446ad, reaching nearly 43,000 rpm—is just 60 percent of the theoretical maximum. Perhaps pulsars with faster periods simply can't form. But the gap between theory and observation may also result from the difficulty in detecting the fastest rotators.

"There is growing evidence that the fastest-spinning pulsars tend to have the steepest spectra," said co-author Ziggy Pleunis, a doctoral student at McGill University in Montreal. The first millisecond pulsar discovered with LOFAR, which was found by Pleunis, is J1552+5437, which spins at 25,000 rpm and also exhibits a steep spectrum. "Since LOFAR searches are more sensitive to these steep-spectrum radio pulsars, we may find that even faster pulsars do, in fact, exist and have been missed by surveys at higher frequencies," he explained.

During its nine years in orbit, Fermi has played a role in the discovery of more than 100 pulsars, either through direct detection of gamma-ray pulses or radio follow-up of unassociated sources.

LOFAR is a radio telescope composed of an international network of antenna stations designed to observe the universe at frequencies between 10 and 250 MHz. Operated by ASTRON, the network includes stations in the Netherlands, Germany, Sweden, the U.K., France, Poland and Ireland.

Source: Phys.org

[Return to Contents](#)

The Night Sky

Tuesday, September 5

- Full Moon tonight (exactly full at 3:03 a.m. on the 6th EDT). After dark this evening, look for the Great Square of Pegasus balancing on one corner far to the Moon's upper left. Its upper-right side points down toward the Moon. Overhead, Deneb is taking over the role of zenith star from brighter Vega (as seen from mid-northern latitudes).

Wednesday, September 6

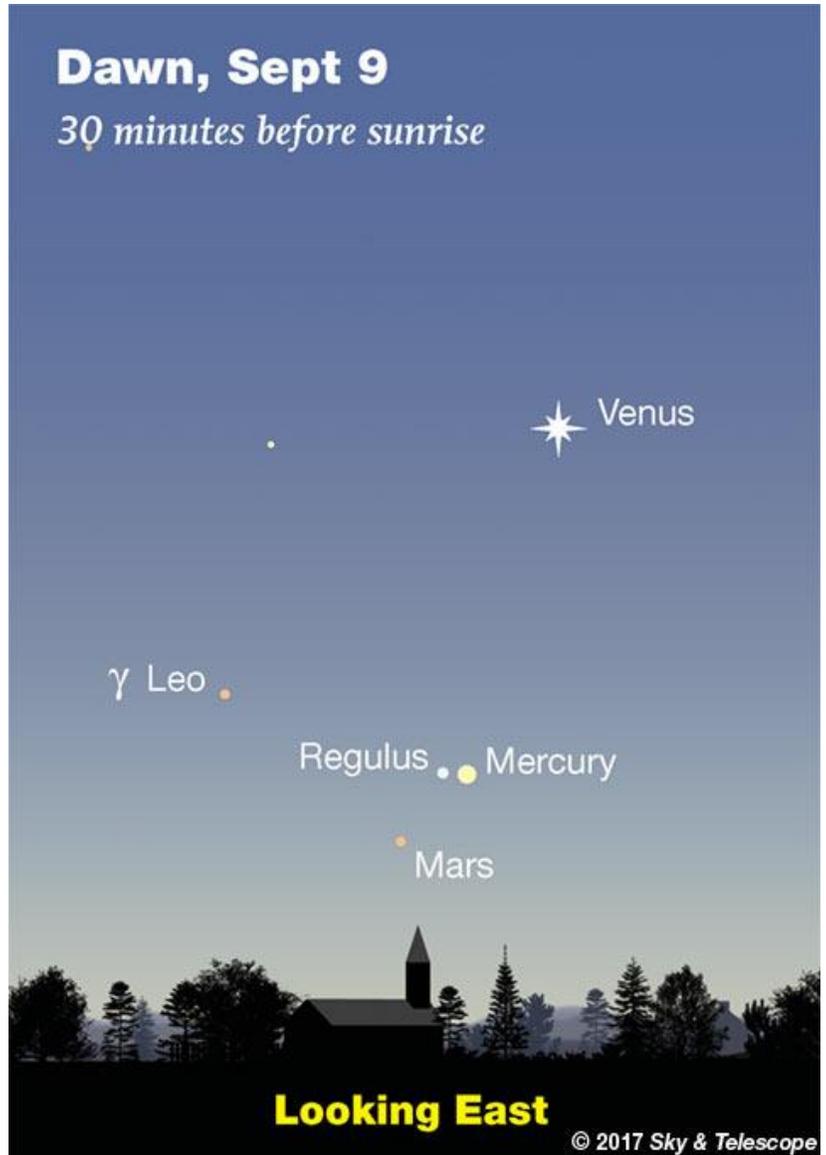
- How soon after sunset can you see the big Summer Triangle? Face east. Vega, the Triangle's brightest star, is nearly at the zenith (for skywatchers at mid-northern latitudes). Deneb is the first bright star to Vega's east-northeast. Altair shines less high in the southeast.

Thursday, September 7

- *A winter preview:* Step out before the first light of dawn this week, and the sky displays the same starry panorama as it does after dinnertime in late January. Orion is striding up in the southeast, with Aldebaran and then the Pleiades high above it. Sirius and Canis Major sparkle below Orion. The Gemini twins are lying on their sides well up in the east.

Friday, September 8

- *A dawn challenge:* Very low in the east as dawn brightens on Saturday morning the 9th, Mercury, now a respectable magnitude 0, glows 1° to the right of Regulus, magnitude 1.3. Mars, fainter at magnitude 1.8, is about 3° to their lower left, as shown above. Bring binoculars.



Source: [Sky & Telescope](#)

[Return to Contents](#)

ISS Sighting Opportunities

[For Denver:](#)

Date	Visible	Max Height	Appears	Disappears
Tue Sep 5, 4:08 AM	< 1 min	21°	21° above ENE	18° above ENE
Tue Sep 5, 5:41 AM	5 min	25°	13° above WNW	10° above NNE
Wed Sep 6, 4:51 AM	2 min	39°	39° above NNW	16° above NNE
Thu Sep 7, 4:01 AM	< 1 min	19°	19° above NE	19° above NE
Thu Sep 7, 5:33 AM	4 min	16°	11° above NW	10° above NNE
Fri Sep 8, 4:43 AM	2 min	21°	21° above NNW	10° above NNE

Sighting information for other cities can be found at NASA's [Satellite Sighting Information](#)

NASA-TV Highlights

(all times Eastern Daylight Time)

- **10 p.m., Tuesday, September 5** - Replay of the NASA Television Special Program – “Voyager -- 40th Anniversary” Live from the Smithsonian’s National Air and Space Museum and the Jet Propulsion Laboratory (all channels)
- **11:30 a.m., Wednesday, September 6** - ISS Expedition 53 In-Flight Event for the Venice Film Festival for ESA with Flight Engineer Paolo Nespoli of the European Space Agency (starts at 11:40 a.m.) (all channels)
- **12 p.m., Wednesday, September 6** - Video File of the ISS Expedition 53-54 Crew’s Departure from the Gagarin Cosmonaut Training Center in Star City, Russia for the Baikonur Cosmodrome in Kazakhstan (Misurkin, Vande Hei, Acaba) (all channels)
- **12 p.m., Wednesday, September 6** - Video File of ISS Expedition 53-54 Crew Activities in Baikonur, Kazakhstan (all channels)
- **12:30 p.m., Wednesday, September 6** - Video File of ISS Expedition 52 Crew Post-Landing Return Activities (all channels)
- **2 p.m., Thursday, September 7** - Video File of the ISS Expedition 53-54 Crew’s Pre-Launch Activities at the Baikonur Cosmodrome in Kazakhstan (Misurkin, Vande Hei, Acaba; includes previously recorded material) (all channels)
- **10 a.m., Friday, September 8** - ISS Expedition 53 In-Flight Educational Event with the Citadel STEM Center at the Laing Middle School near Charleston, S.C. (starts at 10:20 a.m.) (all channels)
- **2 p.m., Friday, September 8** - Video File of the ISS Expedition 53-54 Crew’s Pre-Launch Media Day Activities at the Baikonur Cosmodrome in Kazakhstan (Misurkin, Vande Hei, Acaba) (all channels)

Watch NASA TV on the Net by going to the [NASA website](#).

[Return to Contents](#)

Space Calendar

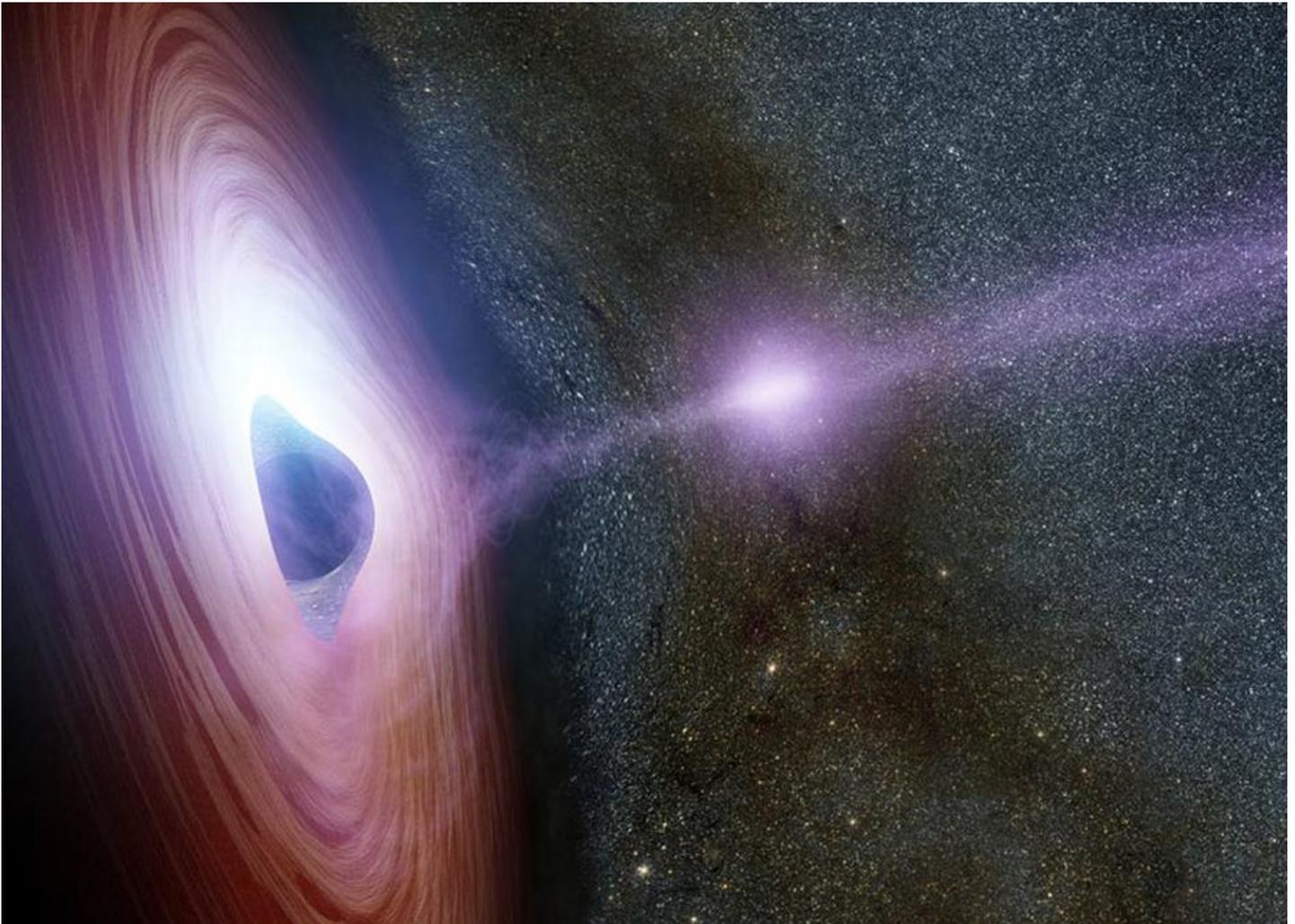
- Sep 05 - [Intelsat 37E/ BSAT 4A Ariane 5 Launch](#)
- Sep 05 - [Neptune At Opposition](#)
- Sep 05 - [Comet C/2017 E4 \(Lovejoy\) Closest Approach To Earth](#) (2.293 AU)
- Sep 05 - [Comet 3D/Biela Closest Approach To Earth](#) (2.824 AU)
- Sep 05 - [Apollo Asteroid 2017 QO Near-Earth Flyby](#) (0.087 AU)
- Sep 05 - [Apollo Asteroid 5786 Talos Closest Approach To Earth](#) (0.956 AU)
- Sep 05 - [Asteroid 1095 Tulipa Closest Approach To Earth](#) (2.085 AU)
- Sep 05 - **UPDATED** [Aug 31] [40th Anniversary \(1977\), Voyager 1 Launch](#)
- Sep 06 - [VRSS 2 \(Antonio Jose de Sucre\) CZ-2D Launch](#)
- Sep 06 - [Moon Occults Neptune](#)
- Sep 06 - [Comet P/2016 J1-A \(PANSTARRS\) Closest Approach To Earth](#) (2.181 AU)
- Sep 06 - [Comet P/2016 J1-B \(PANSTARRS\) Closest Approach To Earth](#) (2.181 AU)
- Sep 06 - [Comet C/2016 T3 \(PANSTARRS\) Perihelion](#) (2.650 AU)
- Sep 06 - [Comet C/2016 P4 \(PANSTARRS\) At Opposition](#) (5.330 AU)
- Sep 06 - **NEW** [Sep 03] [Apollo Asteroid 2017 RB Near-Earth Flyby](#) (0.010 AU)
- Sep 06 - [Asteroid 18125 Brianwilson Closest Approach To Earth](#) (1.724 AU)
- Sep 06 - [Kuiper Belt Object 145452 \(2005 RN43\) At Opposition](#) (39.622 AU)
- Sep 06 - [Edward Appleton's 125th Birthday \(1892\)](#)
- Sep 07 - **HOT** [Sep 01] [X-37B OTV-5 Falcon 9 Launch](#)
- Sep 07 - [Comet 298P/Christensen At Opposition](#) (3.936 AU)
- Sep 07 - [Apollo Asteroid 2012 FH38 Near-Earth Flyby](#) (0.072 AU)
- Sep 07 - [Asteroid 3259 Brownlee Closest Approach To Earth](#) (2.533 AU)
- Sep 07 - [Centaur Object 37117 Narcissus At Opposition](#) (3.561 AU)
- Sep 07 - [Kuiper Belt Object 2010 RF43 At Opposition](#) (52.546 AU)
- Sep 07 - [10th Anniversary \(2007\), Guadalajara Meteorite Fall \(Hit House in Mexico\)](#)
- Sep 08 - **HOT** [Sep 01] [50th Anniversary \(1967\), Surveyor 5 Launch \(Moon Lander\)](#)
- Sep 08 - [Comet 73P-AQ/Schwassmann-Wachmann Closest Approach To Earth](#) (1.138 AU)
- Sep 08 - [Comet 14P/Wolf At Opposition](#) (1.864 AU)
- Sep 08 - [Asteroid 727 Nipponia Closest Approach To Earth](#) (1.429 AU)
- Sep 08 - [Asteroid 3594 Scotti Closest Approach To Earth](#) (1.597 AU)
- Sep 08 - [Asteroid 270553 Loureed Closest Approach To Earth](#) (1.739 AU)
- Sep 08 - [Asteroid 296907 Alexander Closest Approach To Earth](#) (1.919 AU)
- Sep 08 - [25th Anniversary \(1992\), Geotail, Moon Flyby](#)
- Sep 08 - [Arthur Wahl's 100th Birthday \(1917\)](#)
- Sep 08 - [Hans Fichtner's 100th Birthday \(1917\)](#)
-

Source: [JPL Space Calendar](#)

[Return to Contents](#)

Food for Thought

How The Universe Became Filled With Light



Soon after the Big Bang, the universe went completely dark.

The intense, seminal event that created the cosmos churned up so much hot, thick gas that light was completely trapped. Much later--perhaps as many as one billion years after the Big Bang--the universe expanded, became more transparent, and eventually filled up with galaxies, planets, stars, and other objects that give off visible light. That's the universe we know today.

How it emerged from the cosmic dark ages to a clearer, light-filled state remains a mystery.

In a new study, researchers at the University of Iowa offer a theory of how that happened. They think black holes that dwell in the center of galaxies fling out matter so violently that the ejected material pierces its cloudy surroundings, allowing light to escape. The researchers arrived at their theory after observing a nearby galaxy from which ultraviolet light is escaping.

"The observations show the presence of very bright X-ray sources that are likely accreting black holes," says Philip Kaaret, professor in the UI Department of Physics and Astronomy and corresponding author on the

study. "It's possible the black hole is creating winds that help the ionizing radiation from the stars escape. Thus, black holes may have helped make the universe transparent."

Kaaret and his team focused on a galaxy called Tol 1247-232, located some 600 million light years from Earth, one of only three nearby galaxies from which ultraviolet light has been found to escape. In May 2016, using an Earth-orbiting telescope called Chandra, the researchers saw a single X-ray source whose brightness waxed and waned and was located within a vigorous star-forming region of Tol 1247-232.

The team determined it was something other than a star.

"Stars don't have changes in brightness," Kaaret says. "Our sun is a good example of that.

"To change in brightness, you have to be a small object, and that really narrows it down to a black hole," he says.

But how would a black hole, whose intense gravitational pull sucks in everything around it, also eject matter?

The quick answer is no one knows for sure. Black holes, after all, are hard to study, in part because their immense gravitational pull allows no light to escape and because they're embedded deep within galaxies. Recently, however, astronomers have offered an explanation: The jets of escaping matter are tapping into the accelerated rotational energy of the black hole itself.

Imagine a figure skater twirling with outstretched arms. As the skater folds her arms closer to her body, she spins faster. Black holes operate much the same way: As gravity pulls matter inward toward a black hole, the black hole likewise spins faster. As the black hole's gravitational pull increases, the speed also creates energy.

"As matter falls into a black hole, it starts to spin and the rapid rotation pushes some fraction of the matter out," Kaaret says. "They're producing these strong winds that could be opening an escape route for ultraviolet light. That could be what happened with the early galaxies."

Kaaret plans to study Tol 1247-232 more closely and find other nearby galaxies that are leaking ultraviolet light, which would help corroborate his theory.

The paper, "Resolving the X-ray emission from the Lyman continuum emitting galaxy Tol 1247-232," was published online Aug. 2 in the journal Monthly Notices of the Royal Astronomical Society.

Source: SpaceRef.com

[Return to Contents](#)

Space Image of the Week



Europa and Jupiter from Voyager 1

Image Credit: [NASA](#), [Voyager 1](#), [JPL](#), [Caltech](#); *Processing & License:* [Alexis Tranchandon](#) / [Solaris](#)

Explanation: What are those spots on Jupiter? Largest and furthest, just right of center, is the [Great Red Spot](#) -- a huge [storm system](#) that has been raging on [Jupiter](#) possibly since [Giovanni Cassini's](#) likely notation of it [352 years ago](#). It is not yet known why this [Great Spot is red](#). The spot toward the lower left is one of Jupiter's largest moons: [Europa](#). Images from [Voyager](#) in 1979 bolster the modern hypothesis that Europa has an underground ocean and is therefore a [good place to look for extraterrestrial life](#). But what about the dark spot on the upper right? That is a shadow of another of Jupiter's large moons: [Io](#). Voyager 1 discovered [Io](#) to be so volcanic that no [impact craters](#) could be found. Sixteen frames from [Voyager 1's](#) flyby of Jupiter in 1979 were recently reprocessed and merged to create the [featured image](#). Forty years ago today, [Voyager 1](#) launched from Earth and started one of the [greatest explorations](#) of the [Solar System](#) ever.

Source: [APOD](#)

[Return to Contents](#)