

# Space News Update

– September 7, 2018 –

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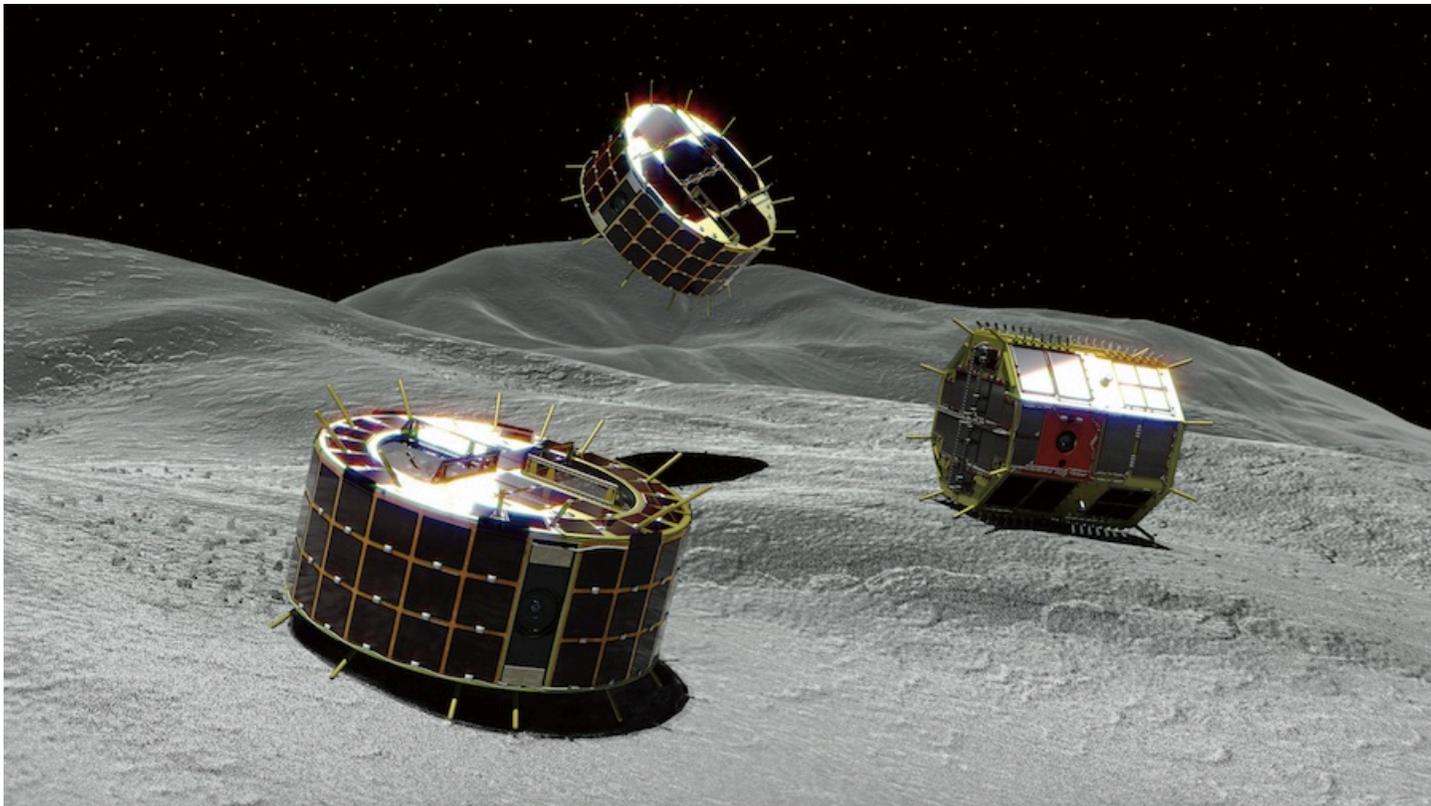
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## 1. Hayabusa 2 team sets dates for asteroid landings



Japan's Hayabusa 2 spacecraft is preparing to release three hopping robots to land on asteroid Ryugu in the coming month, with tiny instruments scientists hope will explore the airless world's boulder-strewn landscape and return the first images from the surface of an asteroid.

Two of the landers developed by the Japanese space agency will be deployed together by Hayabusa 2 on Sept. 21, and another landing probe provided by German and French scientists is set for its descent to Ryugu on Oct. 3.

Those landing attempts will be preceded by a landing rehearsal using the Hayabusa 2 spacecraft to approach within 100 feet (30 meters) of Ryugu next week. The spacecraft is scheduled to reach its closest point to the asteroid Sept. 12, low enough to fire and test its laser range finder, a navigation sensor to be used on future touch-and-go maneuvers to snag a sample of Ryugu for return to Earth.

Next week's practice descent will set the stage for a second rehearsal in mid-October, followed by the full sampling run at the end of next month.

The close-up maneuvers around Ryugu come after more than two months of mapping surveys, revealing Ryugu's appearance for the first time after Hayabusa 2's arrival in late June.

The mission's early reconnaissance of Ryugu allowed scientists to measure its size and mass. The asteroid has a slightly flattened shape, spanning around 3,280 feet (1 kilometer) in diameter along its equator and approximately 2,880 feet (880 meters) from pole-to-pole.

Ryugu makes one rotation every 7.63 hours and has a mass of roughly 450 million metric tons (496 million tons), yielding a calculation of the asteroid's gravity.

Scientists say Ryugu is a C-type asteroid, suggesting it contains primitive building blocks left over the formation of the solar system 4.5 billion years ago. Managed by the Japan Aerospace Exploration Agency, Hayabusa 2 will bring back specimens of the asteroid's primordial surface for analysis in sophisticated laboratories on Earth.

Hayabusa 2's deployable asteroid landers will make a leisurely descent to Ryugu after separation from the Hayabusa 2 mothership at an altitude of around 200 feet (60 meters). Ryugu's tenuous gravity — 80,000 times weaker than Earth's gravity field — will gently tug on the landing probes as they make an uncontrolled free fall to the asteroid, reaching the surface at a speed of less than 1 mph (about 30 centimeters per second).

The first pair of landers to be released Sept. 21 by Hayabusa 2 are carried inside the same container. The MINERVA-II robots, which each weigh a little more than 2.4 pounds (1.1 kilograms), are designed to hop across Ryugu, using cameras, thermometers and other sensors to investigate Ryugu from the surface.

Developed by JAXA, the disk-shaped MINERVA-II landers each have a diameter of 6.7 inches (17 centimeters) — less than the width of a typical dinner plate — and stand around 2.7 inches (7 centimeters) tall. The Hayabusa 2 mothership will put the landers on a trajectory to touch down in Ryugu's northern hemisphere.

A third MINERVA-II lander carried by Hayabusa 2 is set to be released for a landing on Ryugu next year.

The mission's largest landing craft is MASCOT — the Mobile Asteroid Surface Scout — a joint project by the German and French space agencies. It's due to be released by Hayabusa 2 on Oct. 3.

Conceived and designed by the same team that developed the Philae lander, which made the first soft landing on a comet in 2014, the MASCOT spacecraft will bounce to a rest on Ryugu somewhere in the asteroid's southern mid-latitudes.

"It's a very small lander," said Tra-Mi Ho, MASCOT's project manager at DLR, the German space agency. "It's not bigger than a shoebox, and its weight is not more than 10 kilograms (22 pounds)."

The MASCOT lander "carries four scientific instruments," Ho said. "There is a wide-angle camera called MASCAM. It is there to determine the geology — the means to investigate the surface features of Ryugu — and for that it will require imaging at multiple wavelengths.

"We have got a microscope," Ho said in an Aug. 23 press briefing in Japan. "It's a spectral microscope provided by CNES (the French space agency). It is determining the mineralogy. It determines also the content of organic materials and hydrated minerals on the surface — of the water — by investigating the spectral features.

"We have a got a thermal radiometer," Ho continued. "It is called MARA. MARA is detecting or investigating the surface temperature of the asteroid. We have got a magnetometer as well, which is called MASMAG. It is there to determine if a magnetic field exists in the asteroid or in the boulders."

Billed by European scientists as Philae's "little brother," MASCOT carries a self-righting mechanism to orient itself after settling down on Ryugu's surface. The autonomous lander will also try to hop to different positions on the asteroid during its planned 16-hour mission, which is limited by the capacity of the probe's battery.

Ground teams carefully analyzed imagery and science data from Hayabusa 2 to select candidate landing sites for the MINERVA-II and MASCOT spacecraft.

Scientists wanted to ensure none of the landers end up near Hayabusa 2's sampling target, located near Ryugu's equator, and assessed numerous candidate landing sites to find locations relatively free of large

boulders. Managers also considered temperature and communications constraints — all the landers have thermal limits and must relay data back to Earth through Hayabusa 2.

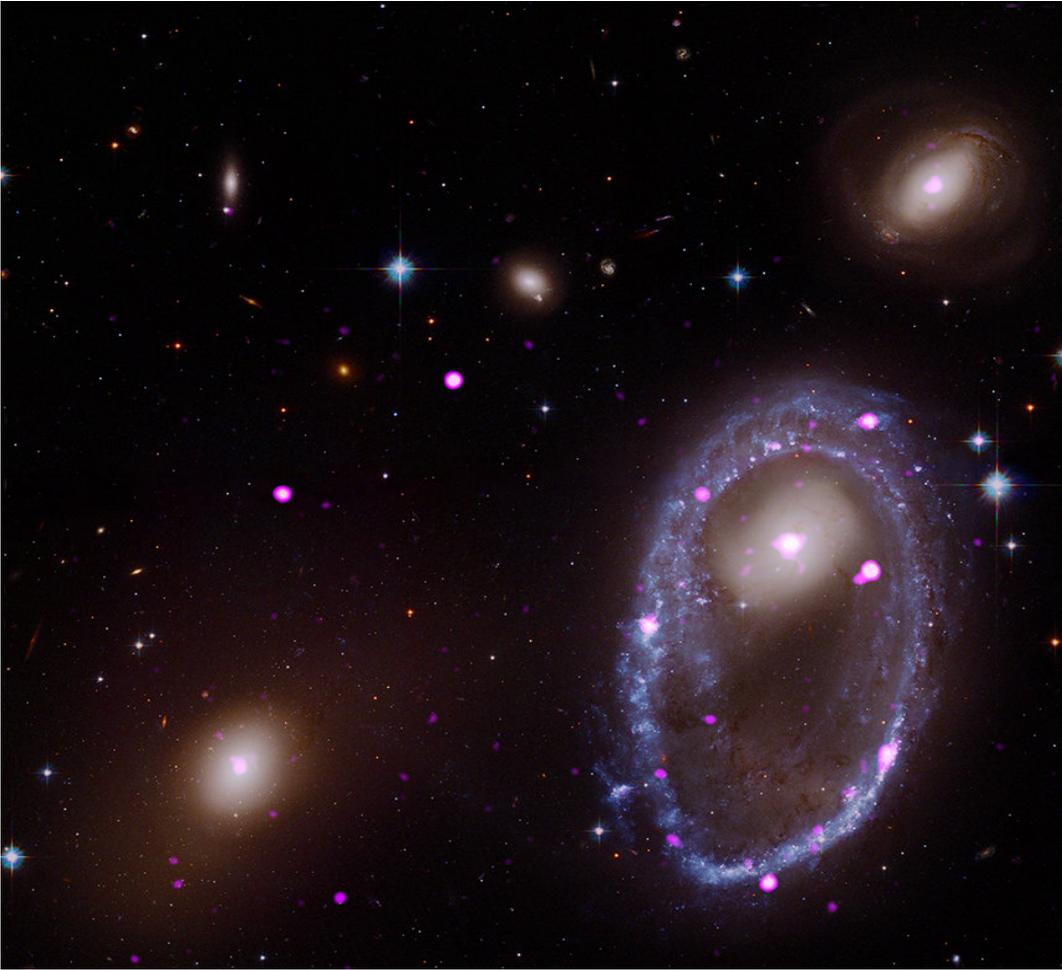
But despite the diligence by engineers and scientists on Earth, the miniature landers must function in an extreme environment, with temperature swings and an asteroid surface marked with numerous boulders that could pose danger for the tiny robots.

“Ryugu seems to be very homogeneous, so you have got more or less the same composition everywhere,” Ho said. “Although we are happy, I think I will have sleepless nights until October,” she said. “Until we land there, we still don’t know how it looks exactly at the landing site ... So the unknown boulder size distribution at the site, which is critical for MASCOT, is still imposing a risk for our mission.”

Source: [Spaceflight Now](#)

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## 2. Cosmic collision forges galactic one ring in X-rays



Astronomers have used NASA's Chandra X-ray Observatory to discover a ring of black holes or neutron stars in a galaxy 300 million light years from Earth.

This ring, while not wielding power over Middle Earth, may help scientists better understand what happens when galaxies smash into one another in catastrophic impacts.

In this new composite image of the galaxy AM 0644-741 (AM 0644 for short), X-rays from Chandra (purple) have been combined with optical data from NASA's Hubble Space Telescope (red, green, and blue). The Chandra data reveal the presence of very bright X-ray sources, most likely binary systems powered by either a stellar-mass black hole or [neutron](#) star, in a remarkable ring. The results are reported in a new paper led by Anna Wolter from INAF-Osservatorio Astronomico di Brera in Milano, Italy.

Where did the ring of [black holes](#) or [neutron stars](#) in AM 0644 come from? Astronomers think that it was created when one galaxy was pulled into another galaxy by the force of gravity. The first galaxy generated ripples in the gas of the second galaxy, AM 0644, located in the lower right. These ripples then produced an expanding ring of gas in AM 0644 that triggered the birth of new stars. The first galaxy is possibly the one located in the lower left of the image.

The most massive of these fledgling stars will lead short lives—in cosmic terms—of millions of years. After that, their nuclear fuel is spent and the stars explode as supernovas leaving behind either black holes with masses typically between about five to twenty times that of the Sun, or neutron stars with a mass approximately equal to that of the Sun.

Some of these black holes or neutron stars have close companion stars, and siphon gas from their stellar partner. This gas falls towards the black hole or neutron star, forming a spinning disk like water circling a drain, and becomes heated by friction. This superheated gas produces large amounts of X-rays that Chandra can detect.

While a ring of black holes or neutron stars is intriguing in itself, there is more to the story of AM 0644. All of the X-ray sources detected in the ring of AM 0644 are bright enough to be classified as ultraluminous X-ray sources (ULXs). This is a class of objects that produce hundreds to thousands of times more X-rays than most "normal" binary systems in which a companion star is in orbit around a neutron star or black hole. Until recently most astronomers thought that ULXs generally contained stellar-mass black holes, with the possible presence in some cases of intermediate-mass black holes (IMBHs) that contain over a hundred times the mass of the Sun. However, this thinking was overturned when a few ULXs in other galaxies, including M82 and M51, were found to contain neutron stars.

Several other explanations besides IMBHs have been suggested for the intense X-ray emission of ULXs. They include unusually rapid growth of the black hole or neutron star, or geometrical effects arising from the funneling of infalling material along magnetic field lines.

The identity of the individual ULXs in AM 0644 is currently unknown. They may be a mixture of black holes and neutron stars, and it is also possible that they are all black holes or all neutron stars.

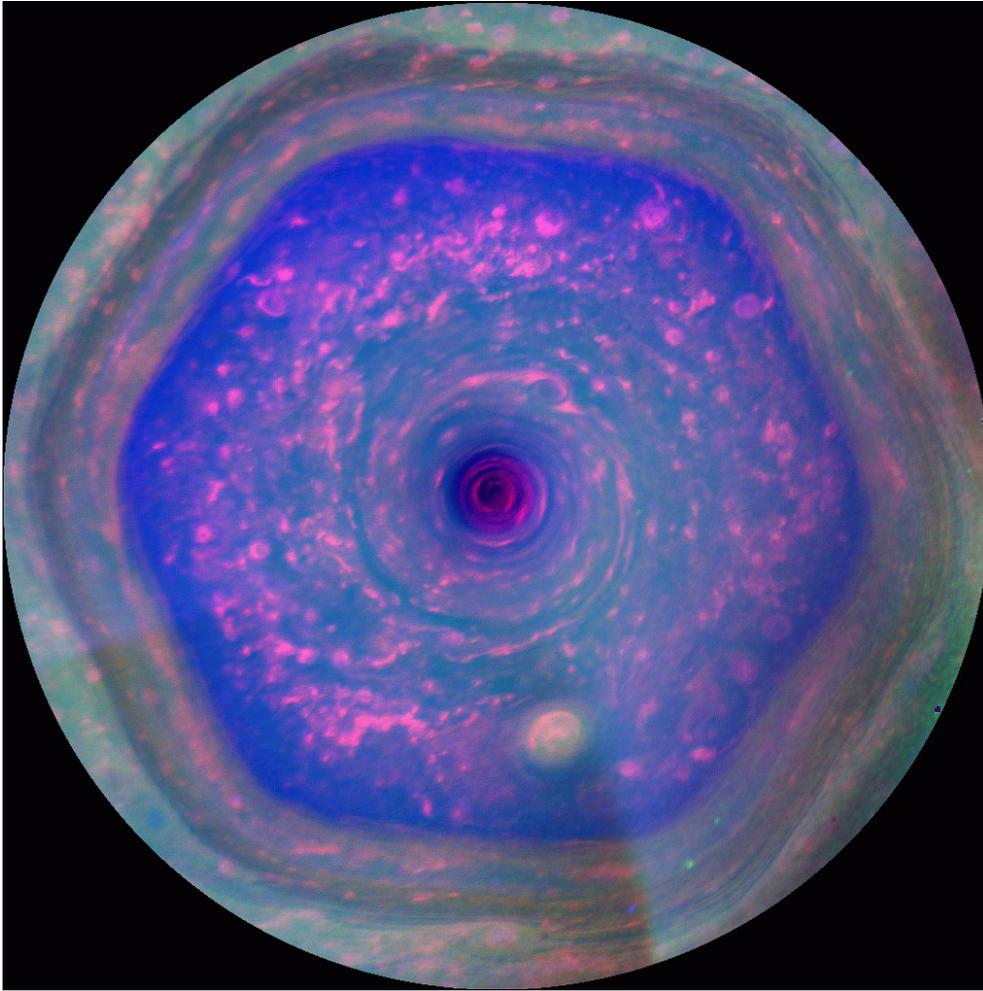
Not all of the X-ray sources in the image are located in the ring of AM 0644. One of the sources is a rapidly growing black hole that's located well behind the galaxy at a distance of 9.1 billion light years from Earth. Another intriguing source detected by Chandra is a growing supermassive black hole located at the center of the galaxy. In the new study, the researchers also used Chandra observations to study six other ring galaxies in addition to AM 0644. A total of 63 sources were detected in the seven galaxies, and 50 of them are ULXs. The authors see a larger average number of ULXs per galaxy in these ring galaxies than in other types of galaxies. Ring galaxies have stimulated the interest of astronomers because they are ideal testbeds for examining models of how double stars form, and understanding the origin of ULXs.

The paper describing the study of AM 0644 and its sister ring [galaxies](#) appeared in the August 10, 2018 issue of the *Astrophysical Journal* and is [available online](#).

Source: [Phys.org](#)

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### 3. Saturn's Famous Hexagon May Tower Above the Clouds



A new long-term study using data from NASA's Cassini spacecraft has revealed a surprising feature emerging at Saturn's northern pole as it nears summertime: a warming, high-altitude vortex with a hexagonal shape, akin to the famous hexagon seen deeper down in Saturn's clouds.

The finding, published Sept. 3 in [Nature Communications](#), is intriguing, because it suggests that the lower-altitude hexagon may influence what happens above, and that it could be a towering structure hundreds of miles in height.

When Cassini arrived at the Saturnian system in 2004, the southern hemisphere was enjoying summertime, while the northern was in the midst of winter. The spacecraft spied a broad, warm high-altitude vortex at Saturn's southern pole but none at the planet's northern pole. The new study reports the first glimpses of a northern polar vortex forming high in the atmosphere, as Saturn's northern hemisphere approached summertime. This warm vortex sits hundreds of miles above the clouds, in the stratosphere, and reveals an unexpected surprise.

*"The edges of this newly-found vortex appear to be hexagonal, precisely matching a famous and bizarre hexagonal cloud pattern we see deeper down in Saturn's atmosphere,"* said Leigh Fletcher of the University of Leicester, lead author of the new study.

Saturn's cloud levels host the majority of the planet's weather, including the pre-existing north polar hexagon. This feature was discovered by NASA's Voyager spacecraft in the 1980s and has been studied for decades; a

long-lasting wave potentially tied to Saturn's rotation, it is a type of phenomenon also seen on Earth, as in the Polar Jet Stream.

Its properties were revealed in detail by Cassini, which observed the feature in multiple wavelengths -- from the ultraviolet to the infrared -- using instruments including its Composite Infrared Spectrometer (CIRS). However, at the start of the mission this instrument could not peer farther up into the northern stratosphere, where temperatures were too cold for reliable CIRS infrared observations, leaving these higher-altitude regions relatively unexplored for many years.

"The mystery and extent of the hexagon continue to grow, even after Cassini's 13 years in orbit around Saturn," said Linda Spilker, Cassini project scientist. "I look forward to seeing other new discoveries that remain to be found in the Cassini data."

For more on the new study, visit the European Space Agency's story here:

<http://sci.esa.int/cassini-huygens/60589-saturn-s-famous-hexagon-may-tower-above-the-clouds/>

Source: [JPL](#)

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# The Night Sky

## Friday, September 7

- Four bright planets still shine during twilight, though one is getting very low and tricky. From right to left, they are Venus very low in the west-southwest, Jupiter upper left of Venus, Saturn higher in the south, and Mars well to the left of Saturn. Best viewing time that includes Venus: 30 or 40 minutes after sunset.

- Neptune is at opposition.

## Saturday, September 8

- The two brightest stars (not planets) of September evenings are Vega high overhead and Arcturus in the west. Both are magnitude 0.

Draw a line down from Vega to Arcturus. A third of the way down you cross the dim Keystone of Hercules. Two thirds of the way you cross the dim semicircle of Corona Borealis with its one modestly bright star: Alphecca, the gem of the crown.

## Sunday, September 9

- Mars shines fire-color in the south-southeast after dusk. High above it, by three or four fists at arm's length, sparkles white Altair. And a finger width above Altair is fainter Tarazed, an orange giant much more luminous than Altair but 22 times farther in the background.

- New Moon (exact at 2:01 p.m. Eastern Daylight Time).

## Monday, September 10

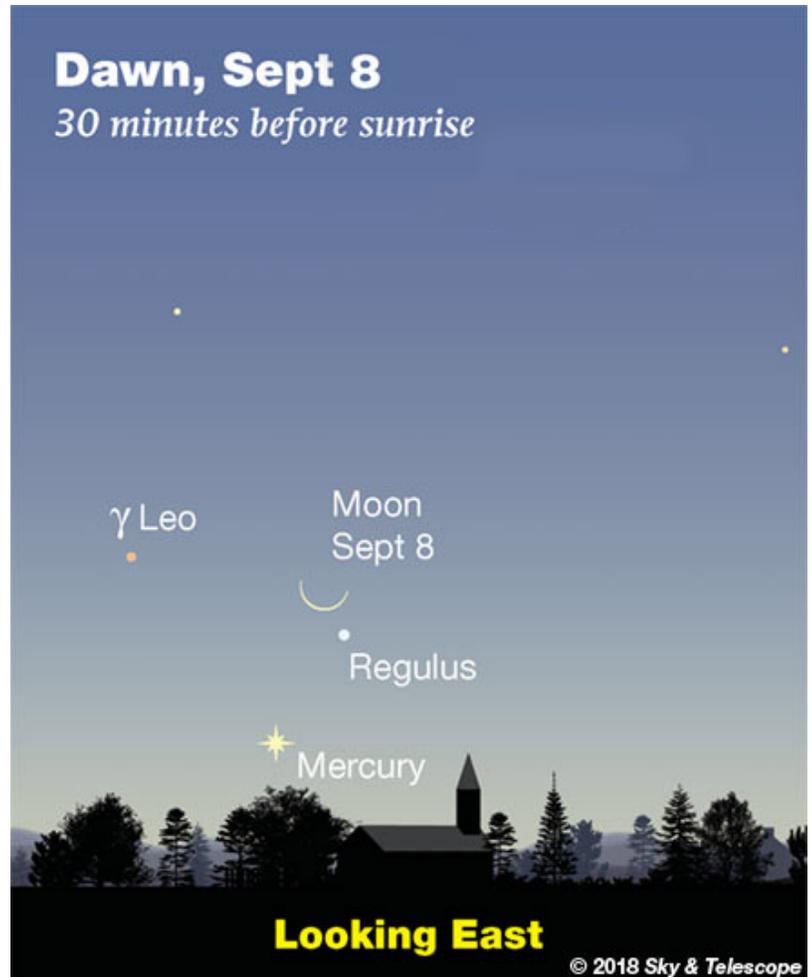
- Before the Moon comes back into the evening sky later this week, make the most of observing the Milky Way in however dark a sky you have. When Deneb crosses your zenith in mid-evening, you know the Milky Way does too — running straight up from the southwest horizon and straight down to the northeast horizon.

## Tuesday, September 11

- Vega now passes the zenith an hour after sunset during late twilight, for those of us at mid-northern latitudes. It's bigger, hotter, and 50 times brighter than our Sun. But at 25 light-years, it's 1.6 million times farther away.

Source: [Sky & Telescope](#)

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# ISS Sighting Opportunities

[For Denver:](#)

Date	Visible	Max Height	Appears	Disappears
Fri Sep 7, 5:12 AM	2 min	11°	10° above NNW	10° above N
Sat Sep 8, 4:21 AM	1 min	12°	12° above N	10° above NNE
Sat Sep 8, 5:58 AM	2 min	11°	10° above N	10° above NNE
Sun Sep 9, 5:06 AM	< 1 min	10°	10° above N	10° above N
Mon Sep 10, 4:14 AM	< 1 min	10°	10° above N	10° above N
Mon Sep 10, 5:50 AM	3 min	14°	10° above NNW	12° above NE
Tue Sep 11, 4:58 AM	2 min	11°	10° above N	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)

### **September 7, Friday**

6:40 a.m. – Live interviews from Goddard Space Flight Center on the upcoming launch of the ICESat-2 mission (Media Channel)

11 a.m. – SpaceCast Weekly (Public Channel)

2 p.m. - Science Chat - Dawn: Mission to Small Worlds (All Channels)

4 p.m., 9 p.m. – Replay of SpaceCast Weekly (All Channels)

6 p.m., 8 p.m., 10 p.m. – Replay of Science Chat - Dawn: Mission to Small Worlds (All Channels)

### **September 8, Saturday**

9 a.m. – Space Station In-Flight Event for the European Space Agency with German President Frank-Walter Steinmaier in Berlin, Germany and ESA astronaut Alexander Gerst (Public Channel with interpretation; Media Channel in native language)

### **September 10, Monday**

6 p.m. – Coverage of the Launch of the JAXA H-II Rocket and the H-II Transfer Vehicle-7/"Kounotori" Cargo Craft from Tanegashima, Japan to the the International Space Station; launch scheduled at 6:32 p.m. EDT from the Johnson Space Center via Tanegashima, Japan (All Channels)

### **September 11, Tuesday**

10:20 a.m. – Space Station In-Flight Interview with Bob Woodruff of ABC News and Space Station Commander Drew Feustel of NASA – (All Channels)

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

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# Space Calendar

- Sep 07 - [Azerspace 2 \(Intelsat 38\)/ Horizons 3e](#) Ariane 5 Launch
- Sep 07 - [Neptune At Opposition](#)
- Sep 07 - [Asteroid 633 Zelima Occults HIP 109139](#) (4.3 Magnitude Star)
- Sep 07 - [Apollo Asteroid 2008 PW4 Near-Earth Flyby](#) (0.075 AU)
- Sep 07 - [Amor Asteroid 2007 RZ8 Near-Earth Flyby](#) (0.095 AU)
- Sep 07 - [Aten Asteroid 5381 Sekmet Closest Approach To Earth](#) (0.993 AU)
- Sep 07 - [Asteroid 274020 Skywalker Closest Approach To Earth](#) (1.486 AU)
- Sep 07 - [Apollo Asteroid 5731 Zeus Closest Approach To Earth](#) (2.436 AU)
- Sep 07 - [Kuiper Belt Object 145452 \(2005 RN43\) At Opposition](#) (39.617 AU)
- Sep 07 - [Lecture: NASA@60 - The Role of the Robots](#), Pasadena, California
- Sep 07 - [Joseph Hubbard's 195th Birthday](#) (1823)
- Sep 08 - [Comet C/2015 V1 \(PANSTARRS\) At Opposition](#) (3.891 AU)
- Sep 08 - **NEW** [Sep 06] [Apollo Asteroid 2018 RF](#) Near-Earth Flyby (0.030 AU)
- Sep 08 - [Kuiper Belt Object 2010 RF43 At Opposition](#) (52.738 AU)
- Sep 08-16 - [Merritt Fall Star Quest 2018](#), Loon Lake, Canada
- Sep 09 - **UPDATED** [Sep 05] [Telstar 18V/APStar 5C Falcon 9 Launch](#)
- Sep 09 - [Comet P/2018 L5 \(Leonard\) Closest Approach To Earth](#) (1.463 AU)
- Sep 09 - [Comet P/2008 O2 \(McNaught\) Closest Approach To Earth](#) (2.813 AU)
- Sep 09 - [Comet 266P/Christensen Closest Approach To Earth](#) (2.869 AU)
- Sep 09 - [Comet 214P/LINEAR At Opposition](#) (4.241 AU)
- Sep 09 - [Comet 29P/Schwassmann-Wachmann Closest Approach To Earth](#) (4.771 AU)
- Sep 09 - [Asteroid 253 Mathilde Occults 2UCAC 26555577](#) (12.4 Magnitude Star)
- Sep 09 - **NEW** [Sep 06] [Aten Asteroid 2018 RC](#) Near-Earth Flyby (0.0015 AU)
- Sep 09 - [Apollo Asteroid 2102 Tantalus Closest Approach To Earth](#) (1.620 AU)
- Sep 09 - [Asteroid 416 Vaticana Closest Approach To Earth](#) (1.755 AU)
- Sep 09 - 40th Anniversary (1978), [Venera 11](#) Launch (USSR Venus Lander)
- Sep 10 - [HTV-7 H-2B Launch](#) (International Space Station)
- Sep 10 - [Comet 21P/Giacobini-Zinner Perihelion](#) (1.013 AU)
- Sep 10 - [Comet P/2008 O2 \(McNaught\) At Opposition](#) (2.813 AU)
- Sep 10 - [Comet C/2015 T2 \(PANSTARRS\) Closest Approach To Earth](#) (6.986 AU)
- Sep 10 - [Comet 29P/Schwassmann-Wachmann At Opposition](#) (4.771 AU)
- Sep 10 - [Asteroid 8275 Inca Closest Approach To Earth](#) (1.348 AU)
- Sep 10 - [Asteroid 44016 Jimmypage Closest Approach To Earth](#) (1.772 AU)
- Sep 11 - [Comet 21P/Giacobini-Zinner Closest Approach To Earth](#) (0.392 AU)
- Sep 11 - [Comet 73P-Y/Schwassmann-Wachmann Perihelion](#) (0.946 AU)
- Sep 11 - [Comet P/2007 T4 \(Gibbs\) At Opposition](#) (2.444 AU)
- Sep 11 - [Asteroid 4 Vesta Occults TYC 6832-00088-1](#) (12.2 Magnitude Star)
- Sep 11 - [Asteroid 253 Mathilde Occults 2UCAC 26556032](#) (11.5 Magnitude Star)
- Sep 11 - **NEW** [Sep 01] [Apollo Asteroid 2018 QU1](#) Near-Earth Flyby (0.028 AU)
- Sep 11 - [Apollo Asteroid 2008 KZ5 Near-Earth Flyby](#) (0.075 AU)
- Sep 11 - [Apollo Asteroid 504800 \(2010 CO1\) Near-Earth Flyby](#) (0.081 AU)
- Sep 11 - 120th Anniversary (1898), [Max Wolf's](#) Discovery of [Asteroid 434 Hungaria](#)

Source: [JPL Space Calendar](#)

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# Food for Thought

## Russians Blame Soyuz Leak on Human Error



Ruling out a strike by space debris or a micrometeoroid, Russian engineers say a [small leak in a Soyuz crew ferry ship docked to the International Space Station](#) was the result of a hole drilled into the wall of the spacecraft's upper compartment, an apparent case of human error. The hole was discovered and patched last week.

According to Russian media accounts, Dmitry Rogozin, director general of the Russian space agency Roscosmos, told reporters Monday the hole was drilled "by a human hand" and that he was not ruling out any theories, saying it could have happened on the ground before launch or after the spacecraft reached orbit June 6.

Known for controversial comments and tweets, Rogozin — a former deputy prime minister who was sanctioned by the Obama administration in the wake of Russia's 2014 [annexation of Crimea](#) — did not address why an astronaut or cosmonaut might do such a thing given the obvious danger to the space station and its six-member crew.

"We are considering all the theories," Rogozin said Monday in a report posted in English by the [TASS news agency](#). "The one about a meteorite impact has been rejected because the spaceship's hull was evidently impacted from inside."

While he said it was too early to come to a conclusion, "it seems to be done by a faltering hand."

"It was done by a human hand, there are traces of a drill sliding along the surface," he said. "We don't reject any theories."

He said "it is a matter of honor for Energy Rocket and Space Corporation (Soyuz builder RSC Energia) to find the one responsible for that, to find out whether it was an accidental defect or a deliberate spoilage, and where it was done – either on Earth or in space."

[Sputnik International](#), another Russian news site, reported RSC Energia is carrying out detailed inspections of all Soyuz and Progress supply ships now being prepared for launch to look for any similar problems.

Because the issue involves a Russian spacecraft, NASA had no immediate comment. An official at agency headquarters in Washington referred questions to Roscosmos.

The leak was discovered last Wednesday evening when sensors aboard the space station detected a slow loss of cabin air pressure.

It was not deemed serious enough to wake the crew, but the next morning the four astronauts and two cosmonauts making up Expedition 56 traced the leak to the upper module of the Soyuz MS-09 spacecraft docked to the Russian Rassvet module.

The spacecraft [rocketed into orbit on June 6](#), carrying cosmonaut Sergey Prokopyev, European Space Agency astronaut Alexander Gerst and NASA flight engineer Serena Auñón-Chancellor to the space station.

Photographs of the hole in the Soyuz's upper habitation module that were downlinked by the station crew showed what appeared to be a drilled-out penetration in an interior panel with several nearby gouges like those that would be caused by a drill skipping across a surface before digging in.

Prokopyev and fellow cosmonaut Oleg Artemyev, acting on instructions from the Russian mission control center, plugged the hole with gauze soaked in epoxy. The plug held, and flight controllers boosted cabin air pressure back to normal levels.

The crew was never in any danger, officials said, and a safe re-entry by the Soyuz MS-09 spacecraft was never in question. The upper module can be sealed off and in any case, it is jettisoned prior to atmospheric entry.

Initial Russian media accounts speculated a technician mistakenly drilled the hole during pre-flight processing and then attempted to cover up the mistake.

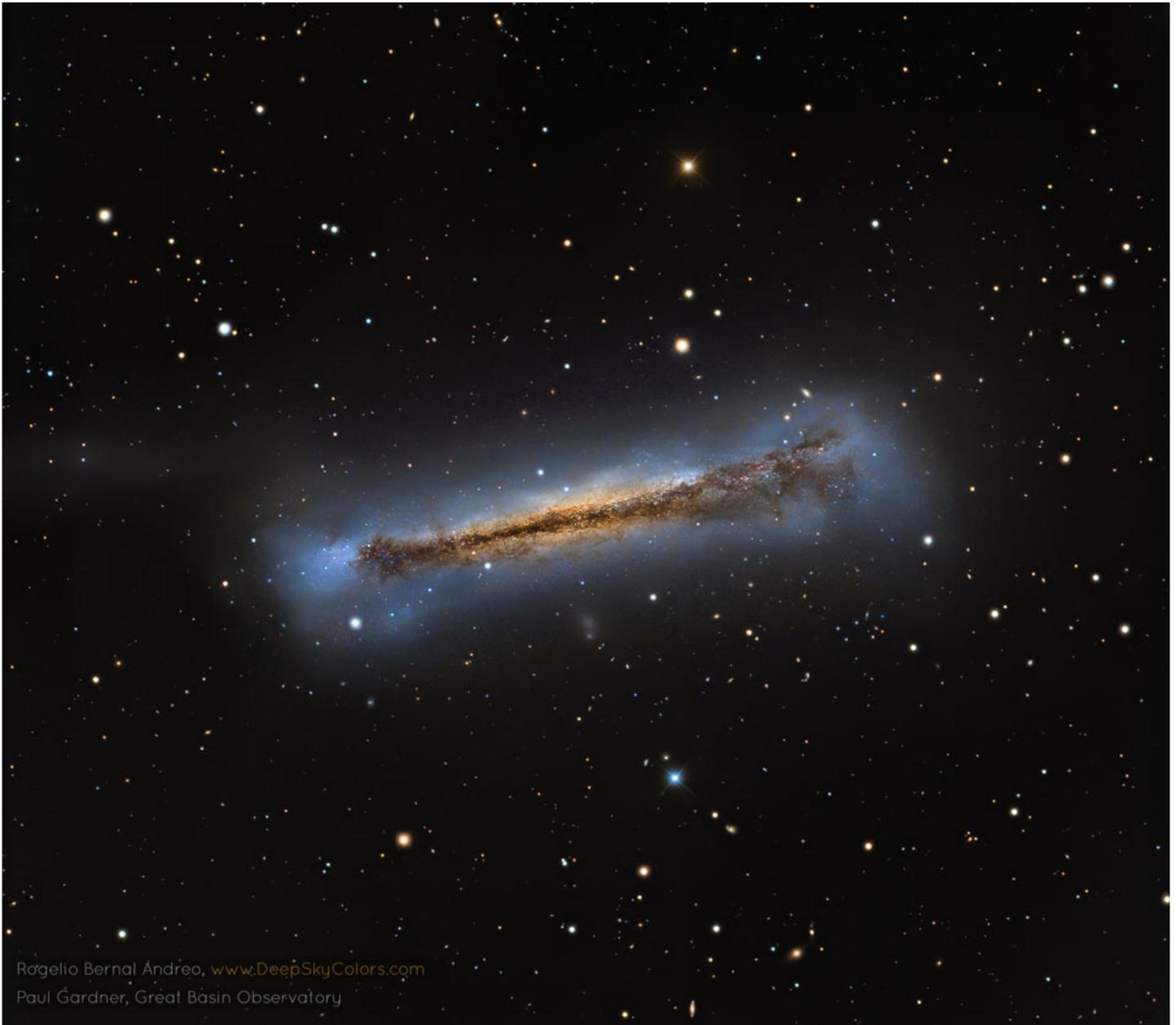
[RIA Novosti](#) quoted a source at Energia saying "the hole was made on the ground. The person responsible for the act of negligence has been identified."

Another source told the news agency the worker did not report the error and instead applied a sealant of some sort. After two months in orbit, the sealant apparently dried out, the source said, and was expelled by the cabin air pressure, opening up a leak.

Source: [CBS News](#)

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## Space Image of the Week



### **NGC 3628: Sideways Spiral Galaxy**

**Image Credit & Copyright:** *Data:* [Paul Gardner, Great Basin Observatory](#); *Processing:* [Rogelio Bernal Andreo \(DeepSkyColors.com\)](#)

**Explanation:** What do spiral galaxies look like sideways? Featured is a sharp telescopic view of a magnificent edge-on spiral [galaxy NGC 3628](#), a puffy [galactic disk](#) divided by dark dust lanes. Of course, this [deep galactic portrait](#) puts some astronomers [in mind](#) of its popular moniker, The Hamburger Galaxy. The tantalizing island [universe](#) is about 100,000 light-years across and 35 million [light-years](#) away in the northern springtime [constellation](#) Leo. [NGC 3628](#) shares its neighborhood in the [local Universe](#) with two other large spirals [M65](#) and [M66](#) in a grouping otherwise known as [the Leo Triplet](#). Gravitational [interactions with](#) its cosmic neighbors are likely responsible for the extended flare and [warp](#) of this spiral's disk.

Source: [APOD](#)

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