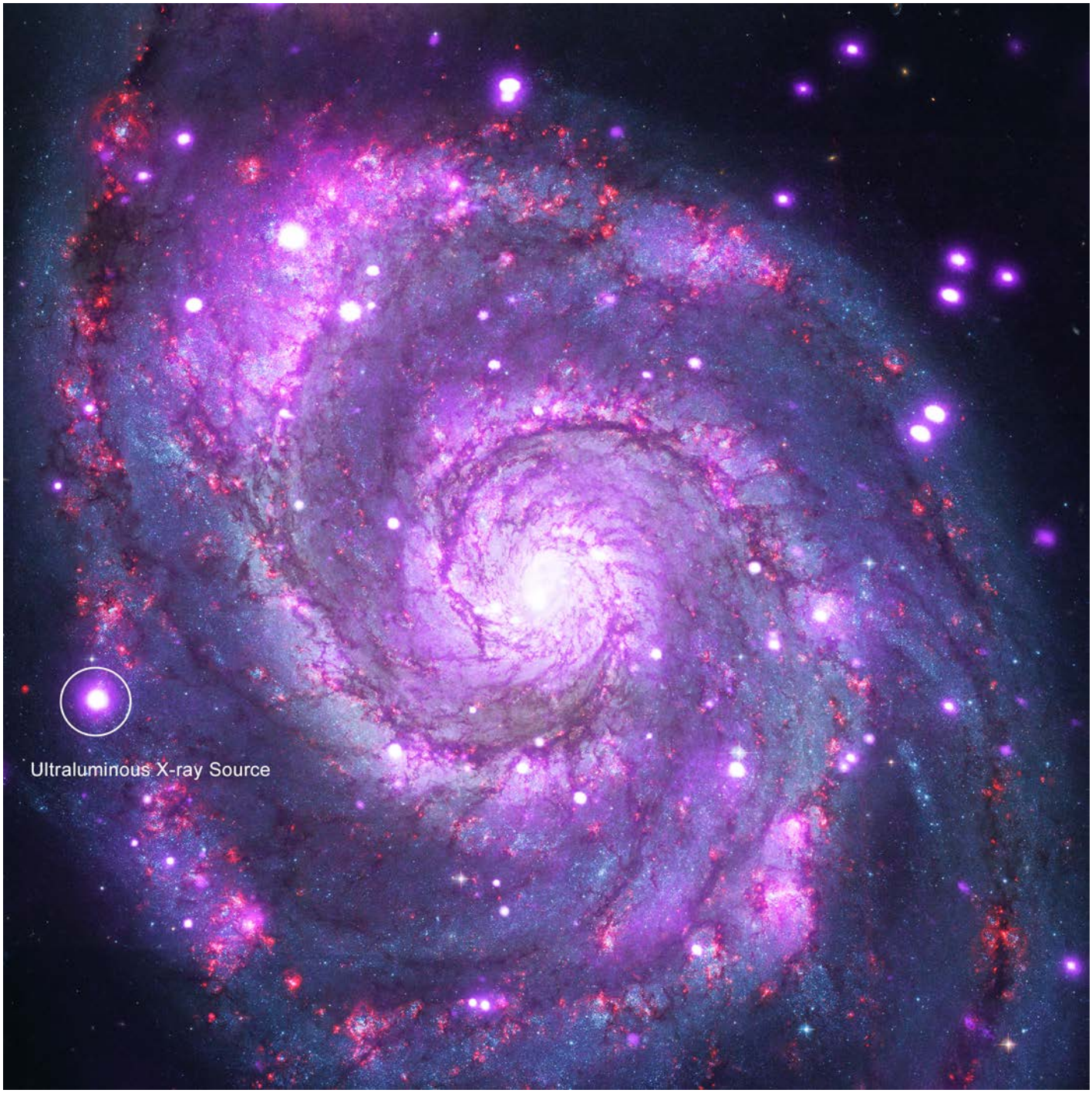
Space News Update

— March 2, 2018 —

Contents

1. Beaming with the Light of Millions of Suns



In the 1980s, scientists started discovering a new class of extremely bright sources of X-rays in galaxies. These sources were a surprise, as they were clearly located away from the supermassive black holes found in the center of galaxies. At first, researchers thought that many of these ultraluminous X-ray sources, or ULXs, were black holes containing masses between about a hundred and a hundred thousand times that of the sun. Later work has shown some of them may be stellar-mass black holes, containing up to a few tens of times the mass of the sun.

In 2014, observations with NASA's NuSTAR (Nuclear Spectroscopic Telescope Array) and Chandra X-ray Observatory showed that a few ULXs, which glow with X-ray light equal in luminosity to the total output at all wavelengths of millions of suns, are even less massive objects called neutron stars. These are the burnt-out

cores of massive stars that exploded. Neutron stars typically contain only about 1.5 times the mass of the sun. Three such ULXs were identified as neutron stars in the last few years. Scientists discovered regular variations, or "pulsations," in the X-ray emission from ULXs, behavior that is exhibited by neutron stars but not black holes.

Now, researchers using data from NASA's Chandra X-ray Observatory have identified a fourth ULX as being a neutron star, and found new clues about how these objects can shine so brightly. The newly characterized ULX is located in the Whirlpool galaxy, also known as M51. This composite image of the Whirlpool contains X-rays from Chandra (purple) and optical data from the Hubble Space Telescope (red, green, and blue). The ULX is marked with a circle.

Neutron stars are extremely dense objects — a teaspoon would weigh more than a billion tons, as much as a mountain. The intense gravity of the neutron stars pulls surrounding material away from companion stars, and as this material falls toward the neutron star, it heats up and glows with X-rays. As more and more matter falls onto the neutron star, there comes a time when the pressure from the resulting X-ray light becomes so intense that it pushes the matter away. Astronomers call this point — when the objects typically cannot accumulate matter any faster and give off any more X-rays — the Eddington limit. The new result shows this ULX is surpassing the Eddington limit for a neutron star.

The scientists analyzed archival X-ray data taken by Chandra and discovered an unusual dip in the ULX's X-ray spectrum, which is the intensity of X-rays measured at different wavelengths. After ruling out other possibilities, they concluded that the dip was likely from a process called cyclotron resonance scattering, which occurs when charged particles — either positively charged protons or negatively charged electrons — circle around in a magnetic field. The size of the dip in the X-ray spectrum, called a cyclotron line, implies magnetic field strengths that are at least 10,000 times greater than those associated with matter spiraling into a stellar-mass black hole, but are within the range observed for neutron stars. This provides strong evidence that this ULX is a neutron star rather than a black hole, and is the first such identification that did not involve the detection of X-ray pulsations.

An accurate determination of the magnetic field strength depends on whether the cause of the cyclotron line, either protons or electrons, is known. If the line is from protons, then the magnetic fields around the neutron star are extremely strong, comparable to the strongest magnetic fields produced by neutron stars, and may in fact be helping to break the Eddington limit. Such strong magnetic fields could reduce the pressure from a ULX's X-rays — the pressure that normally pushes away matter — allowing the neutron star to consume more matter than expected.

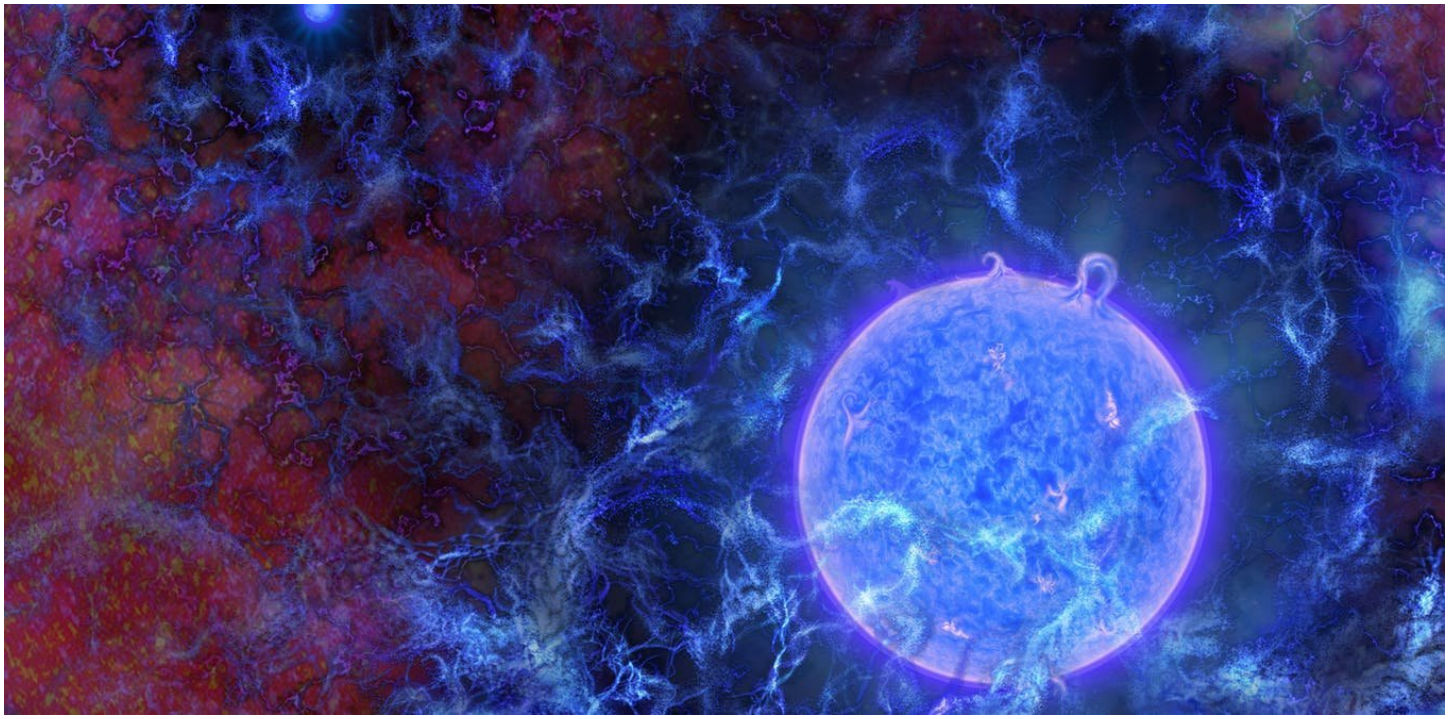
If the cyclotron line is from circling electrons, by contrast, then the magnetic field strength around the neutron star would be about 10,000 times less strong, and thus not powerful enough for the flow onto this neutron star to break the Eddington limit.

The researchers currently don't have a spectrum of the new ULX with enough detail to determine the cyclotron line's origin. To further address this mystery, the researchers are planning to acquire more X-ray data on the ULX in M51 and look for cyclotron lines in other ULXs.

A paper describing this research, led by Murray Brightman of the California Institute of Technology, appears in the latest issue of *Nature Astronomy*.

Source: NASA Return to Contents

2. Signal detected from the first stars in the universe, with a hint that dark matter was involved



A signal caused by the very first stars to form in the universe has been picked up by a tiny but highly specialised radio telescope in the remote Western Australian desert.

Details of the detection are revealed in a paper published today in Nature and tell us these stars formed only 180 million years after the Big Bang.

It's potentially one of the most exciting astronomical discoveries of the decade. A second Nature paper out today links the finding to possibly the first detected evidence that dark matter, thought to make up much of the universe, might interact with ordinary atoms.

Tuning in to the signal

This discovery was made by a small radio antenna operating in the band of 50-100Mhz, which overlaps some well known FM radio stations (which is why the telescope is located in the remote WA desert).

What has been detected is the absorption of light by neutral atomic hydrogen gas, which filled the early universe after it cooled down from the hot plasma of the Big Bang.

At this time (180 million years after the Big Bang) the early universe was expanding, but the densest regions of the universe were collapsing under gravity to make the first stars.

The formation of the first stars had a dramatic effect on the rest of the universe. Ultraviolet radiation from them changed the electron spin in the hydrogen atoms, causing it to absorb the background radio emission of the universe at a natural resonant frequency of 1,420MHz, casting a shadow so to speak.

Now, 13 billion years later, that shadow would be expected at a much lower frequency because the universe has expanded nearly 18-fold in that time.

An early result

Astronomers had been predicting this phenomenon for nearly 20 years and searching for it for ten years. No one quite knew how strong the signal would be or at what frequency to search.

Most expected it would take quite a few more years post 2018.

But the shadow was detected at 78MHz by a team led by astronomer Judd Bowman from Arizona State university.

Amazingly this radio signal detection in 2015-2016 was done by a small aerial (the EDGES experiement), only a few metres in size, coupled to a very clever radio receiver and signal processing system. It's only been published now after rigorous checking.

This is the most important astronomical discovery since the detection of gravitational waves in 2015. The first stars represent the start of everything complex in the universe, the beginning of the long journey to galaxies, solar systems, planets, life and brains.

Detecting their signature is a milestone and pinning down the exact time of their formation is an important measurement for cosmology.

This is an amazing result. But it gets better and even more mysterious and exciting.

Evidence of dark matter?

The signal is twice as strong as expected, which is why it has been detected so early. In the second Nature paper, astronomer Rennan Barkana, from the Tel Aviv University, said it is quite hard to explain why the signal is so strong, as it tells us the hydrogen gas at this time is significantly colder than expected in the standard model of cosmic evolution.

Astronomers like to introduce new kinds of exotic objects to explain things (e.g. super massive stars, black holes) but these generally produce radiation that makes things hotter instead.

How do you make the atoms colder? You have to put them in thermal contact with something even colder, and the most viable suspect is what is known as cold dark matter.

Cold dark matter is the bedrock of modern cosmology. It was introduced in the 1980s to explain how galaxies rotate—they seemed to spin much faster than could be explained by the visible stars and an extra gravitational force was needed.

We now think that dark matter has to be made of a new kind of fundamental particle. There is about six times more dark matter than ordinary matter and if it was made of normal atoms the Big Bang would have looked quite different to what is observed.

As for the nature of this particle, and its mass, we can only guess.

So if cold dark matter is indeed colliding with hydrogen atoms in the early universe and cooling them, this is a major advance and could lead us to pin down its true nature. This would be the first time dark matter has demonstrated any interaction other than gravity.

Here comes the 'but'

A note of caution is warranted. This hydrogen signal is very difficult to detect: it is thousands of times fainter than the background radio noise even for the remote location in Western Australia.

The authors of the first Nature paper have spent more than a year doing a multitude of tests and checks to make sure they have not made a mistake. The sensitivity of their aerial needs to be exquisitely calibrated all across the bandpass. The detection is an impressive technical achievement but astronomers worldwide will be holding their breath until the result is confirmed by an independent experiment.

If it is confirmed then this will open the door to a new window on the early universe and potentially a new understanding of the nature of dark matter by providing a new observational window in to it.

This signal has been detected coming from the whole sky, but in the future it can be mapped on the sky, and the details of the structures in the maps would then give us even more information on the physical properties of the dark matter.

More desert observations

Today's publications are exciting news for Australia in particular. Western Australia is the most radio quiet zone in the world, and will be the prime location for future mapping observations. The Murchison Widefield Array is in operation right now, and future upgrades could provide exactly such a map.

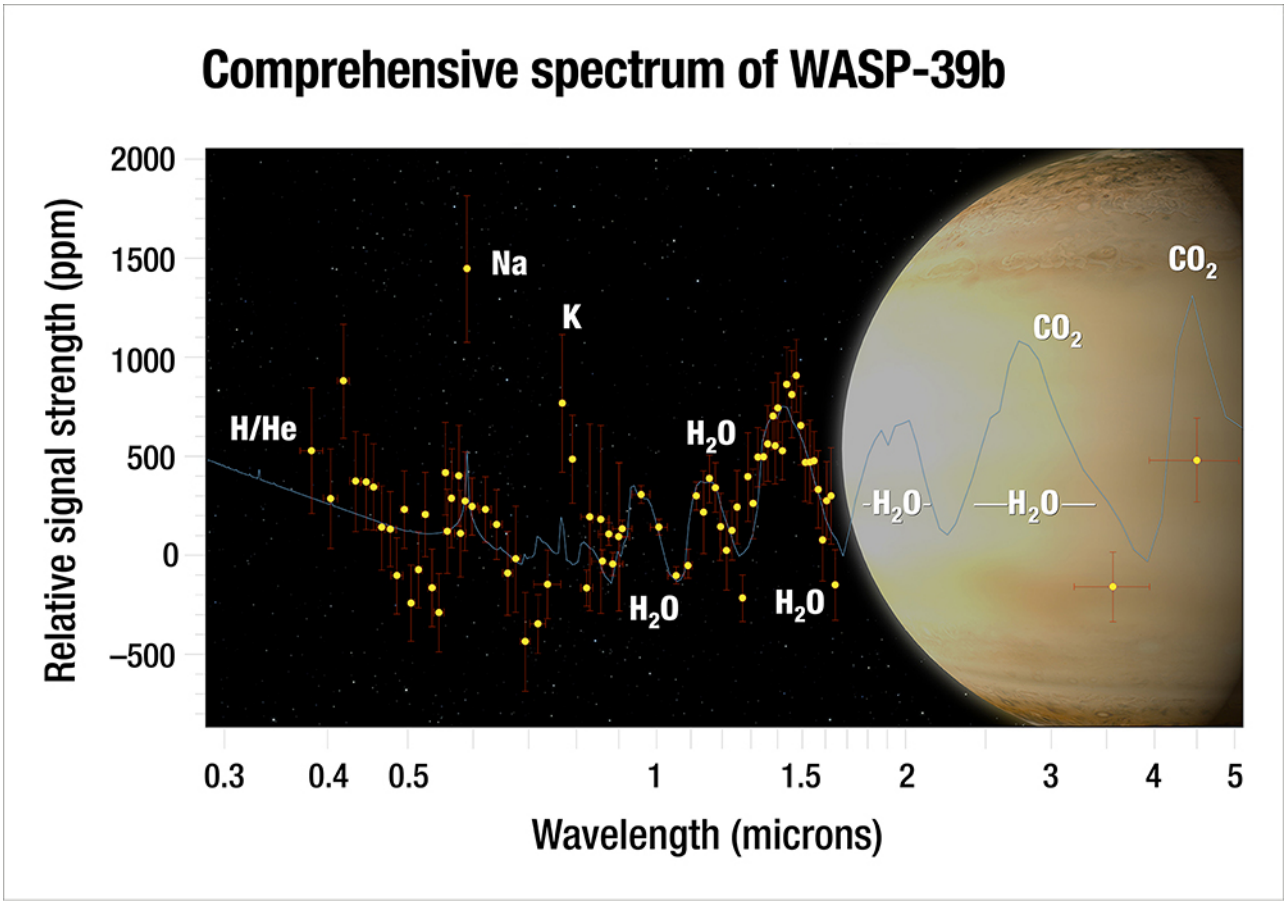
This is also a major science goal of the multi-billion dollar Square Kilometre Array, located in Western Australia, that should be able to provide much greater fidelity pictures of this epoch.

It is extremely exciting to look forward to a time when we will be able to reveal the nature of the first stars and to have a new approach via radio astronomy to tackle dark matter, which has so far proved intractable.

Let's hope the governments of the world, or at least Australia, can keep the frequency of 78 MHz clean of pop music and talk shows so we can continue to observe the birth of the universe.

Source: Phys.org Return to Contents

3. NASA Finds a Large Amount of Water in an Exoplanet's Atmosphere



Much like detectives who study fingerprints to identify the culprit, scientists used NASA's Hubble and Spitzer space telescopes to find the "fingerprints" of water in the atmosphere of a hot, bloated, Saturn-mass exoplanet some 700 light-years away. And, they found a lot of water. In fact, the planet, known as WASP-39b, has three times as much water as Saturn does.

Though no planet like this resides in our solar system, WASP-39b can provide new insights into how and where planets form around a star, say researchers. This exoplanet is so unique, it underscores the fact that the more astronomers learn about the complexity of other worlds, the more there is to learn about their origins. This latest observation is a significant step toward characterizing these worlds.

Although the researchers predicted they'd see water, they were surprised by how much water they found in this "hot Saturn." Because WASP-39b has so much more water than our famously ringed neighbor, it must have formed differently. The amount of water suggests that the planet actually developed far away from the star, where it was bombarded by a lot of icy material. WASP-39b likely had an interesting evolutionary history as it migrated in, taking an epic journey across its planetary system and perhaps obliterating planetary objects in its path.

"We need to look outward so we can understand our own solar system," explained lead investigator Hannah Wakeford of the Space Telescope Science Institute in Baltimore, and the University of Exeter in Devon, United Kingdom. "But exoplanets are showing us that planet formation is more complicated and more confusing than we thought it was. And that's fantastic!"

Wakeford and her team were able to analyze the atmospheric components of this exoplanet, which is similar in mass to Saturn but profoundly different in many other ways. By dissecting starlight filtering through the

planet's atmosphere into its component colors, the team found clear evidence for water. This water is detected as vapor in the atmosphere.

Using Hubble and Spitzer, the team has captured the most complete spectrum of an exoplanet's atmosphere possible with present-day technology. "This spectrum is thus far the most beautiful example we have of what a clear exoplanet atmosphere looks like," said Wakeford.

"WASP-39b shows exoplanets can have much different compositions than those of our solar system," said co-author David Sing of the University of Exeter. "Hopefully, this diversity we see in exoplanets will give us clues in figuring out all the different ways a planet can form and evolve."

Located in the constellation Virgo, WASP-39b whips around a quiet, Sun-like star, called WASP-39, once every four days. The exoplanet is currently positioned more than 20 times closer to its star than Earth is to the Sun. It is tidally locked, meaning it always shows the same face to its star.

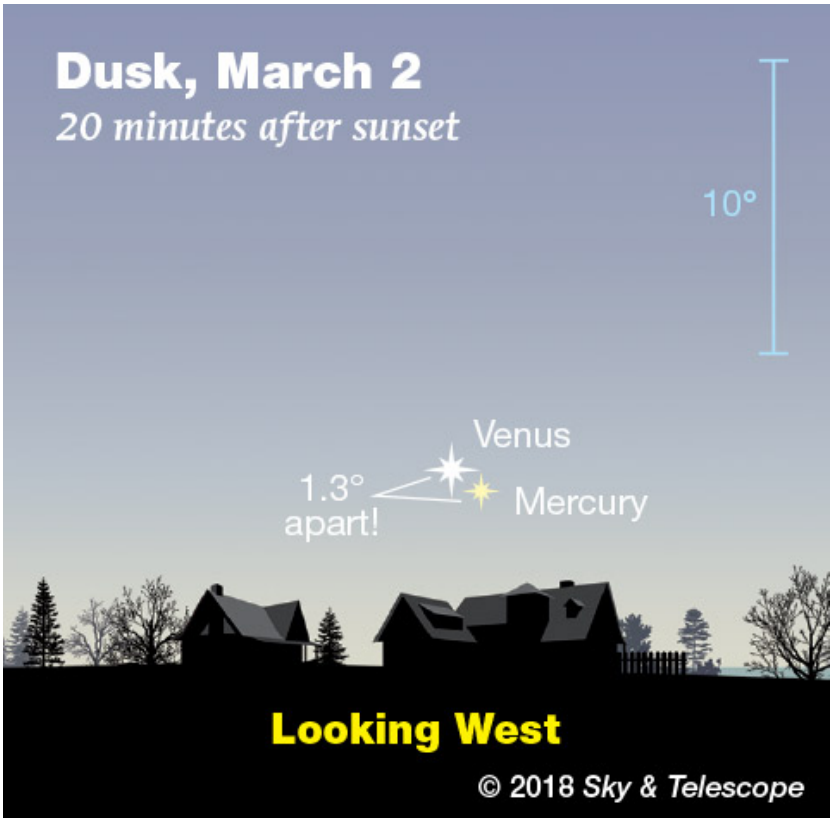
Its day-side temperature is a scorching 1,430 degrees Fahrenheit (776.7 degrees Celsius). Powerful winds transport heat from the dayside around the planet, keeping the permanent nightside almost as hot. Although it is called a "hot Saturn," WASP-39b is not known to have rings. Instead, is has a puffy atmosphere that is free of high-altitude clouds, allowing Wakeford and her team to peer down into its depths.

Looking ahead, Wakeford hopes to use NASA's James Webb Space Telescope - scheduled to launch in 2019 - to get an even more complete spectrum of the exoplanet. Webb will be able to give information about the planet's atmospheric carbon, which absorbs light at longer infrared wavelengths than Hubble can see. By understanding the amount of carbon and oxygen in the atmosphere, scientists can learn even more about where and how this planet formed.

Source: JPL Return to Contents

The Night Sky

Friday, March 2
• Soon after sunset, use binoculars to start looking for Venus and Mercury together just above the west horizon, as shown here.



• If you're in the longitudes of North America, check in on Jupiter's unusually red Great Red Spot with your telescope before dawn tomorrow morning. The GRS should cross Jupiter's central meridian around 6:12 a.m. EST (3:12 a.m. PST) Saturday morning. Features on Jupiter remain closer to the planet's central meridian than to the limb for nearly an hour before and after they transit.

You'll also find Ganymede's tiny black shadow crossing Jupiter's face from 4:29 to 6:15 a.m. EST (1:19 to 3:15 a.m. PST) Saturday morning.

Saturday, March 3
• Today is when Venus and Mercury appear closest together low in bright twilight.

• Now that it's early March, quite soon after dark the Big Dipper stands as high in the northeast as Cassiopeia is in the northwest. Midway between them, as always, is Polaris.

Sunday, March 4
• Have you ever seen Canopus, the second-brightest star after Sirius? In an interesting coincidence, Canopus lies almost due south of Sirius: by 36°. That's far enough south that it never appears above your horizon unless you're below latitude 37° N (southern Virginia, southern Missouri, central California). And there, you'll need a very flat southern horizon. Canopus crosses the south point on the horizon just 21 minutes before Sirius does.

When to look? Canopus is due south when Beta Canis Majoris — Mirzam the Announcer, the star about three finger-widths to the right of Sirius — is at *its* highest point due south (around 7 or 8 p.m. now, depending on how far east or west you are in your time zone). Look straight down from Mirzam then.

Monday, March 5
• After dark, Orion's near-horizontal Belt points to the right toward orange Aldebaran in the west and, farther on, the little Pleiades star cluster subtly glittering.

You might not guess it now, but the Pleiades are heading down to a twilight rendezvous with Venus in seven weeks. They'll pass each other for a few nights around April 23rd.

Tuesday, March 6
• Jupiter and the waning gibbous Moon rise in company around the middle of the night tonight. By early dawn on Thursday, they hang together in fine view in the south.

Source: Sky & Telescope

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ISS Sighting Opportunities

For Denver:

Date	Visible	Max Height	Appears	Disappears
Fri Mar 2, 4:17 AM	< 1 min	21°	21° above ENE	21° above ENE
Fri Mar 2, 5:50 AM	5 min	24°	13° above WNW	11° above NNE
Sat Mar 3, 5:00 AM	3 min	37°	37° above NNW	11° above NE
Sun Mar 4, 4:10 AM	< 1 min	16°	16° above NE	10° above NE
Sun Mar 4, 5:43 AM	4 min	15°	11° above NW	11° above NNE
Mon Mar 5, 4:52 AM	2 min	20°	20° above N	10° above NNE
Tue Mar 6, 4:02 AM	< 1 min	12°	12° above NE	10° above NE
Tue Mar 6, 5:36 AM	2 min	11°	10° above NNW	10° above N

Sighting information for other cities can be found at NASA's Satellite Sighting Information

NASA-TV Highlights

(all times Eastern Daylight Time)

- **1 p.m., Friday, March 2** - SpaceCast Weekly (all channels)
- **4 p.m., 8 p.m., 10 p.m., Friday, March 2 -** Replay of SpaceCast Weekly (all channels)
- **5 p.m., 9 p.m., Friday, March 2** - Replay of the GOES-S Launch Coverage (all channels)
- **8:15 p.m., Friday, March 2 -** GOES-S Launch Coverage (all channels)
- **3 a.m., Saturday, March 3** - ISS Expedition 55 In-Flight Event for JAXA for the International Space Explorers Forum in Tokyo with ISS Commander Anton Shkaplerov of Roscosmos, Scott Tingle of NASA and Norishige Kanai of the Japan Aerospace Exploration Agency (JAXA)(Starts at 3:05 a.m) (all channels)
- **8 a.m., 4 p.m., 10:30 p.m., Saturday, March 3 -** Replay of the GOES-S Launch Coverage (all channels)
- **9 a.m., 5 p.m., 8 p.m., Saturday, March 3 -** Replay of SpaceCast Weekly (all channels)
- **1 p.m., 7 p.m., Saturday, March 3 -** Replay of the Video B-Roll of Training and Past Missions of ISS Expedition 55-56 Crew Members Drew Feustel and Ricky Arnold OF NASA (all channels)
- **1:15 p.m., 7:15 p.m., Saturday, March 3 -** Replay of the Return of ISS Expedition 54 Flight Engineers Mark Vande Hei and Joe Acaba of NASA to Ellington Field, Houston (all channels)
- **2 p.m., 9 p.m., Saturday, March 3 -** The von Kármán Lecture Series: Looking Deep: The InSight Mission to Mars (NTV-1 (Public))
- **8 a.m., 2 p.m., 7:30 p.m., Sunday, March 4 -** Replay of SpaceCast Weekly (all channels)
- **9 a.m., 4 p.m., 8 p.m., Sunday, March 4 -** Replay of the GOES-S Launch Coverage (all channels)

- **10:15 a.m., 5 p.m., 9 p.m., Sunday, March 4 -** Replay of the Video B-Roll of Training and Past Missions of ISS Expedition 55-56 Crew Members Drew Feustel and Ricky Arnold OF NASA (all channels)
- **10:15 a.m., 5:15 p.m., 9:15 p.m., Sunday, March 4 -** Replay of the Return of ISS Expedition 54 Flight Engineers Mark Vande Hei and Joe Acaba of NASA to Ellington Field, Houston (all channels)
- **1 p.m., 6 p.m., Sunday, March 4 -** Replay of the von Kármán Lecture Series: Looking Deep: The InSight Mission to Mars (NTV-1 (Public))
- **12:30 p.m., Tuesday, March 6 -** ISS Expedition 55 In-Flight Educational Event with the University of Massachusetts Dartmouth in North Dartmouth, Massachusetts and NASA Flight Engineer Scott Tingle (all channels)

Watch NASA TV on the Net by going to the NASA website. Return to Contents

Space Calendar

- Mar 02 - UPDATED [Feb 27] Hispasat 30W-6 Falcon 9 Launch
- Mar 02 - NEW [Feb 28] Comet P/2011 WG113 (PANSTARRS) Closest Approach To Earth (0.459 AU)
- Mar 02 - Comet 190P/Mueller At Opposition (3.887 AU)
- Mar 02 - Comet 193P/LINEAR-NEAT At Opposition (3.987 AU)
- Mar 02 - Comet C/2016 T2 (Matheny) At Opposition (4.038 AU)
- Mar 02 - NEW [Feb 28] Aten Asteroid 2018 DV1 Near-Earth Flyby (0.0007 AU)
- Mar 02 - NEW [Feb 28] Aten Asteroid 2018 DU1 Near-Earth Flyby (0.013 AU)
- Mar 03 - Apollo Asteroid 2018 DC Near-Earth Flyby (0.024 AU)
- Mar 03 - NEW [Feb 28] Apollo Asteroid 2018 DS1 Near-Earth Flyby (0.042 AU)
- Mar 03 - NEW [Feb 28] Amor Asteroid 2018 DR1 Near-Earth Flyby (0.073 AU)
- Mar 03 - Apollo Asteroid 2018 CZ2 Near-Earth Flyby (0.080 AU)
- Mar 03 - Asteroid 9661 Hohmann Closest Approach To Earth (3.894 AU)
- Mar 03 - Brian Cox's 50th Birthday (1968)
- Mar 03 - 155th Anniversary (1863), Creation of the National Academy of Sciences
- Mar 04 - Comet 127P/Holt-Olmstead At Opposition (3.212 AU)
- Mar 04 - Amor Asteroid 2018 AF4 Near-Earth Flyby (0.088 AU)
- Mar 04 - Asteroid 2675 Tolkien Closest Approach To Earth (1.424 AU)
- Mar 04 - Asteroid 3530 Hammel Closest Approach To Earth (1.951 AU)
- Mar 04 - Asteroid 132524 APL Closest Approach To Earth (2.215 AU)
- Mar 04 - Kuiper Belt Object 2013 FZ27 At Opposition (47.370 AU)
- Mar 04 - Patrick Moore's 95th Birthday (1923)
- Mar 05 - Mercury Passes 1.4 Degrees From Venus
- Mar 05 - Moon Occults Asteroid 21 Lutetia
- Mar 05 - Kuiper Belt Object 50000 Quaoar Occults 2UCAC 26058326 (14.7 Magnitude Star)
- Mar 05 - Apollo Asteroid 38086 Beowolf Closest Approach To Earth (1.555 AU)
- Mar 05 - Asteroid 716 Berkeley Closest Approach To Earth (1.636 AU)
- Mar 05 - Asteroid 9954 Brachiosaurus Closest Approach To Earth (1.885 AU)
- Mar 05 - Asteroid 10916 Okina-Ouna Closest Approach To Earth (1.906 AU)
- Mar 05 - 50th Anniversary (1968), Solrad 9 Launch (Sun Observer)
- Mar 05 - Valery Korzun's 65th Birthday (1953)
- Mar 06 - HOT [Feb 28] HHK-1/ECA/Moonraker PSLV-XL Launch (Moon Lander)
- Mar 06 - O3b F4 Soyuz Launch
- Mar 06 - Asteroid 2791 Paradise Closest Approach To Earth (1.047 AU)
- Mar 06 - Asteroid 250840 Motorhead Closest Approach To Earth (2.149 AU)
- Mar 06 - Asteroid 742 Edisona Closest Approach To Earth (2.400 AU)
- Mar 06 - Asteroid 39382 Opportunity Closest Approach To Earth (2.990 AU)
- Mar 06 - Carolyn Porco's 65th Birthday (1953)

Source: JPL Space Calendar

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Food for Thought

Bacteria Surviving on Musk's Tesla are Either a Bio-Threat or a Backup Copy of Life on Earth

A great celebratory eruption accompanied the successful launch of SpaceX's Falcon Heavy rocket in early February. That launch was a big moment for people who are thoughtful about the long arc of humanity's future. But the Tesla Roadster that was sent on a long voyage in space aboard that rocket is likely carrying some bacterial hitch-hikers.

A report from Purdue University suggests that, though unlikely, the Roadster may be carrying an unwelcome cargo of Earthly bacteria to any destination it reaches. But we're talking science here, and science doesn't necessarily shy away from the unlikely.

NASA takes spacecraft microbial contamination very seriously. The Office of Planetary Protectionmonitors and enforces spacecraft sterilization. Spreading Terran bacteria to other worlds is a no-no, for obvious reasons, so spacecraft are routinely sterilized to prevent any bacterial hitch-hikers. NASA uses the term "biological burden" to quantify how rigorously a spacecraft needs to be sterilized. Depending on a spacecraft's mission and destination, the craft is subjected to increasingly stringent sterilization procedures.

If a craft is not likely to ever contact another body, then sterilization isn't as strict. If the target is a place like Mars, where the presence of Martian life is undetermined, then the craft is prepared differently. When required, spacecraft and spacecraft components are treated in clean rooms like the one at Goddard Space Flight Center.

The clean rooms are strictly controlled environments, where staff wear protective suits, boots, hoodies, and surgical gloves. The air is filtered and the spacecraft are exposed to various types of sterilization. After sterilization, the spacecraft is handled carefully before launch to ensure it remains sterile. But the Tesla Roadster never visited such a place, since it's destination is not another body.

The Tesla Roadster in space was certainly manufactured in a clean place, but there's a big difference between clean and sterile. To use NASA's terminology, the bacterial load of the Roadster is probably very high. But would those bacteria survive?

The atmosphere in space is most definitely hostile to life. The temperature extremes, the low pressure, and the radiation are all hazardous. But, some bacteria could survive by going dormant, and there are nooks and crannies in the Tesla where life could cling.

The Tesla is not predicted to come into contact with any other body, and certainly not Mars, which is definitely a destination in our Solar System that we want to protect from contamination. In fact, a more likely eventual destination for the Roadster is Earth, albeit millions of years from now. And in that case, according to Alina Alexeenko, a Professor of Aeronautics and Astronautics at Purdue University, any bacteria on the red Roadster is more like a back-up for life on Earth, in case we do something stupid before the car returns. "The load of bacteria on the Tesla could be considered a biothreat, or a backup copy of life on Earth," she said.

But even if some bacteria survived for a while in some hidden recess somewhere on the Tesla Roadster, could it realistically survive for millions of years in space?

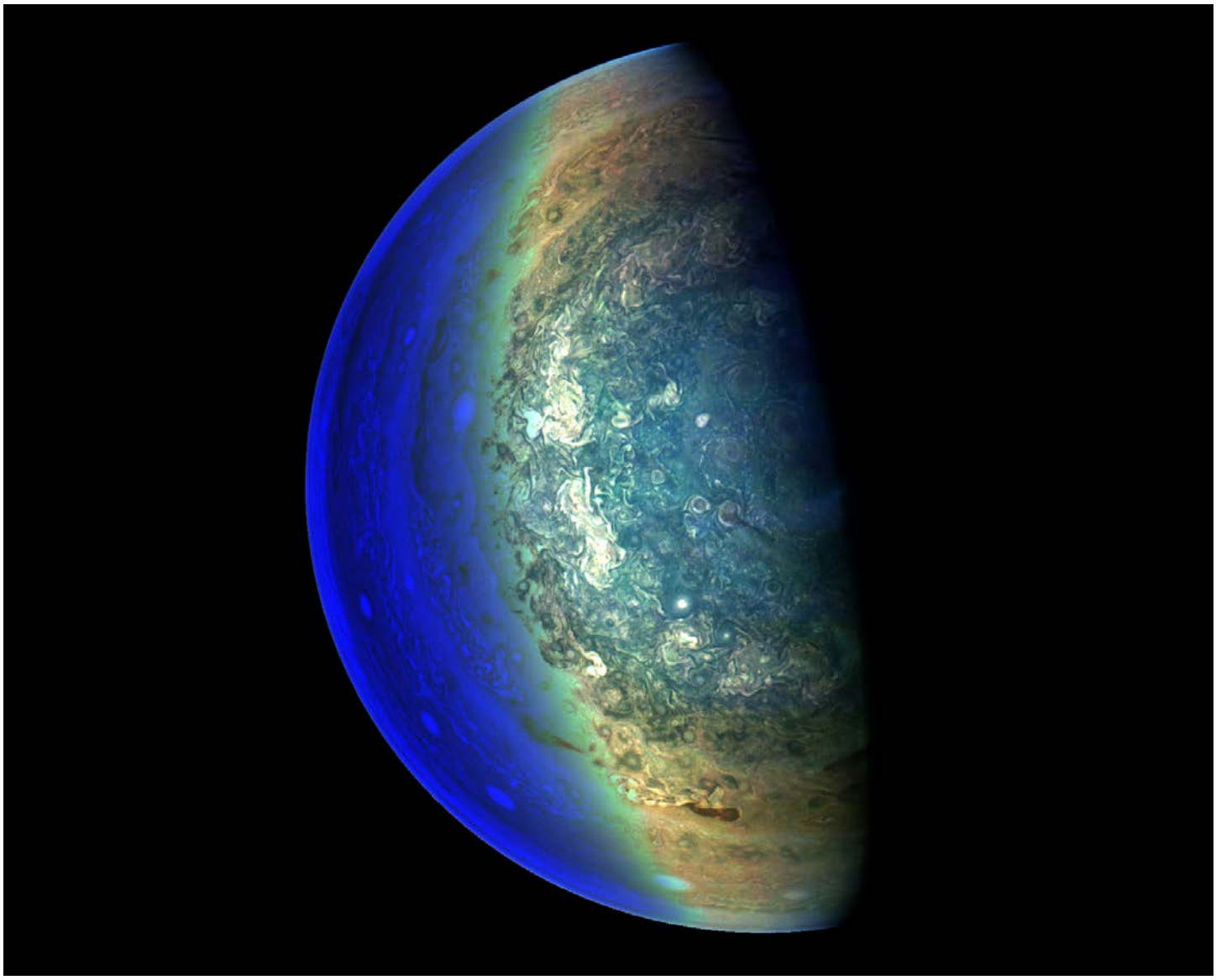
As far as NASA is concerned, length of time in space is one component of sterilization. Some missions are designed with the craft placed in a long-term orbit at the end of its mission, so that the space environment can eventually destroy any lingering bacterial life secreted away somewhere. Surely, if the Roadster does ever collide with Earth, and if it takes millions of years for that to happen, and if it's not destroyed on re-entry, the car would be sterilized by its long-duration journey?

That seems to be the far more likely outcome. You never know for sure, but the space-faring Roadster is probably not a hazardous bio-threat, nor a back-up for life on Earth; those are pretty fanciful ideas.

Musk's pretty red car is likely just a harmless, attention-grabbing bauble.

Source: Universe Today Return to Contents

Space Image of the Week



Jovian ‘Twilight Zone’

This image captures the swirling cloud formations around the south pole of Jupiter, looking up toward the equatorial region.

NASA’s Juno spacecraft took the color-enhanced image during its eleventh close flyby of the gas giant planet on Feb. 7 at 7:11 a.m. PST (10:11 a.m. EST). At the time, the spacecraft was 74,896 miles (120,533 kilometers) from the tops of Jupiter’s clouds at 84.9 degrees south latitude.

Citizen scientist Gerald Eichstädt processed this image using data from the JunoCam imager. This image was created by reprocessing raw JunoCam data using trajectory and pointing data from the spacecraft. This image is one in a series of images taken in an experiment to capture the best results for illuminated parts of Jupiter's polar region.

To make features more visible in Jupiter’s terminator — the region where day meets night — the Juno team adjusted JunoCam so that it would perform like a portrait photographer taking multiple photos at different exposures, hoping to capture one image with the intended light balance. For JunoCam to collect enough light

to reveal features in Jupiter's dark twilight zone, the much brighter illuminated day-side of Jupiter becomes overexposed with the higher exposure.

JunoCam's raw images are available for the public to peruse and process into image products at: www.missionjuno.swri.edu/junocam

Source: NASA Return to Contents