

# Space News Update

– April 7, 2017 –

## Contents

### In the News

#### Story 1:

ALMA captures explosive star birth

#### Story 2:

An Atmosphere Has Been Detected Around an Earth-Like Exoplanet

#### Story 3:

NASA unveiled new plans for getting humans to Mars, and hardly anyone noticed

### Departments

#### The Night Sky

#### ISS Sighting Opportunities

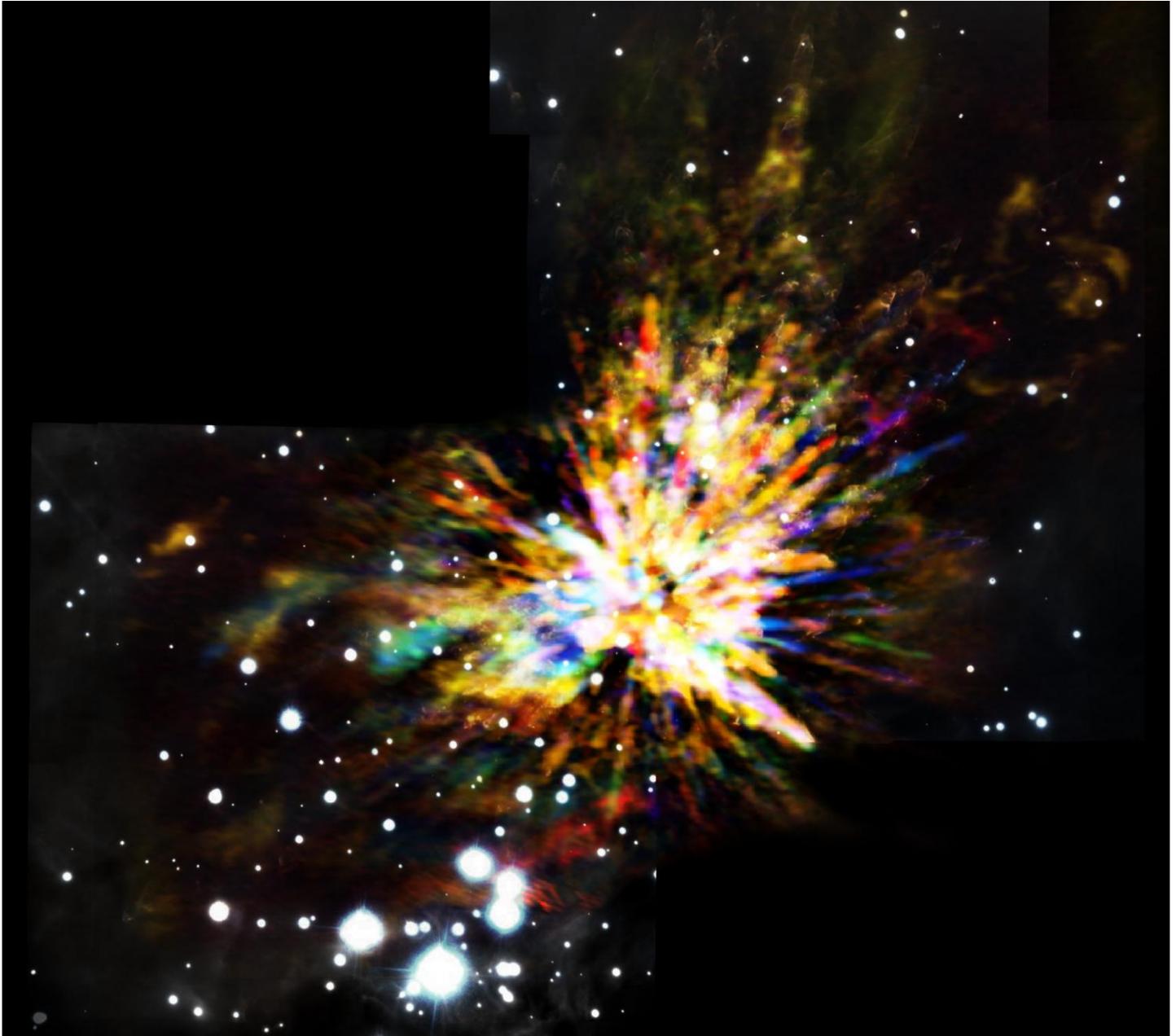
#### Space Calendar

#### NASA-TV Highlights

#### Food for Thought

#### Space Image of the Week

## 1. ALMA captures explosive star birth



Star birth can be a violent and explosive event, as dramatically illustrated in new ALMA images.

Around 500 years ago, a pair of adolescent protostars had a perilously close encounter that blasted their [stellar nursery](#) apart.

Astronomers using the Atacama Large Millimeter/submillimeter Array (ALMA) have examined the widely scattered debris from this explosive event, gaining new insights into the sometimes-fierce relationship among sibling [stars](#).

Shortly after starting to form some 100,000 years ago, several protostars in the Orion Molecular Cloud 1 (OMC-1), a dense and active star factory about 1,500 light-years from Earth just behind the Orion Nebula, latched onto each other gravitationally and gradually drew closer.

Eventually, two of these stars either grazed each other or collided, triggering a powerful eruption that launched other nearby protostars and hundreds of giant streamers of dust and gas into interstellar space at speeds greater than 150 kilometers per second. This cataclysmic interaction released as much energy as our Sun emits over the course of 10 million years.

Today, the remains of this spectacular explosion are visible from Earth.

"What we see in this once calm stellar nursery is a cosmic version of a 4th of July fireworks display, with giant streamers rocketing off in all directions," said John Bally with the University of Colorado and lead author on a paper published in the *Astrophysical Journal*.

Groups of stars such as those in OMC-1 are born when a cloud of gas hundreds of times more massive than our Sun begins to collapse under its own gravity. In the densest regions, protostars form and begin to drift about randomly. Over time, this random motion can dampen, which allows some of the stars to fall toward a common center of gravity, usually dominated by a particularly large [protostar](#).

If these stars draw too close to each other before they drift away into the galaxy, violent interactions can occur.

According to the researchers, such explosions are expected to be relatively short lived, with the remnants like those seen by ALMA lasting only centuries.

"Though fleeting, protostellar explosions may be relatively common," said Bally. "By destroying their parent cloud, as we see in OMC-1, such explosions may also help to regulate the pace of star formation in these giant molecular clouds."

Bally and his team observed this feature previously with the Gemini-South telescope in Chile. These earlier images, taken in the near infrared, reveal the remarkable structure of the streamers, which extend nearly a light-year from end to end.

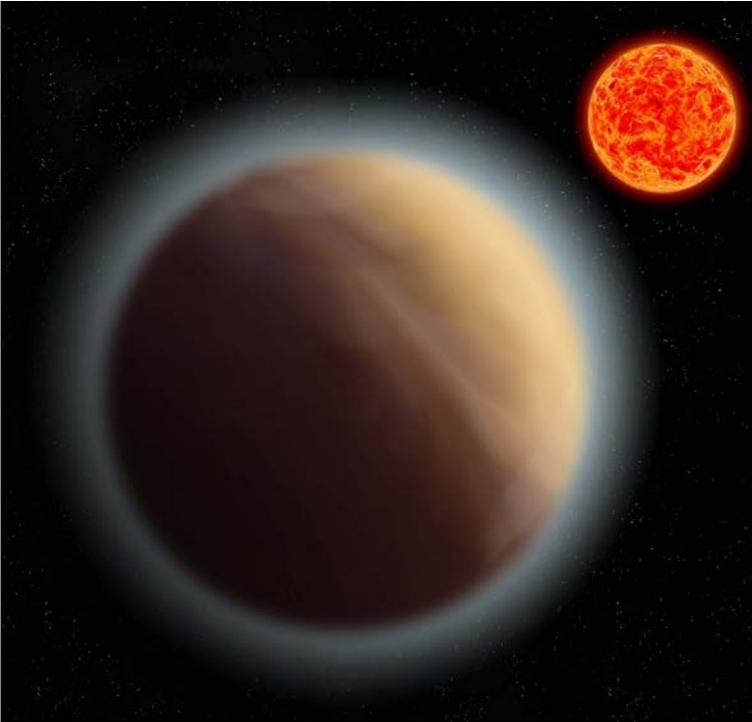
Hints of the explosive nature of this outflow were first uncovered in 2009 with the Submillimeter Array in Hawaii. The new ALMA data, however, provide much greater clarity, unveiling important details about the distribution and high-velocity motion of the carbon monoxide (CO) gas inside the streamers. This helps astronomers understand the underlying force of the blast and the impact such events could have on star formation across the galaxy.

"People most often associate stellar explosions with ancient stars, like a nova eruption on the surface of a decaying star or the even more spectacular supernova death of an extremely massive star," Bally says. "ALMA has given us new insights into explosions on the other end of the stellar life cycle, [star birth](#)."

Source: [Phys.org](#)

[Return to Contents](#)

## 2. An Atmosphere Has Been Detected Around an Earth-Like Exoplanet



Astronomers have detected an atmosphere around an Earth-like exoplanet called [Gliese 1132b](#) (GJ 1132b for short), which is located around 39 light-years away in the constellation [Vela](#).

This is the first time atmosphere has ever been detected around a planet with a mass and radius so similar to Earth's, and that makes it a hugely promising (and exciting) target for researchers searching for signs of extraterrestrial life.

"While this is not the detection of life on another planet, it's an important step in the right direction: the detection of an atmosphere around the super-Earth GJ 1132b marks the first time that an atmosphere has been detected around an Earth-like planet other than Earth itself," [said lead researcher John Southworth](#) from Keele University in the UK.

There's still a lot to learn about GJ 1132b's atmosphere, but early observations suggest it could be a "[water world' with an atmosphere of hot steam](#)" - AKA, a pretty awesome place to go looking for life.

So far, we know that GJ 1132b has a mass about 1.6 times that of Earth's, and has roughly 1.4 times its radius - which in terms of exoplanets makes it remarkably similar to our home planet.

But as with all exoplanet discoveries, the researchers are quick to remind the public that the observations to date still really don't give us much insight into how similar GJ 1132b could be to Earth - or how habitable.

Some bad news upfront is it has an estimated surface temperature of 370 degrees Celsius (698 degrees Fahrenheit), which makes it unlikely that it could host life like us.

And let's not forget that we've recently been burned by [the detection of the TRAPPIST-1 'sister solar system'](#) and neighbouring [Earth-like planet Proxima b](#), both of which are unlikely to be the [friendly places for life](#) we first thought they were.

But none of those planets had ever gotten as far as having an atmosphere detected, so GJ 1132b is already doing pretty well in terms of a spot that could potentially host life.

Right now, the top strategy for astronomers in the search for life on another planet is to detect the chemical composition of that planet's atmosphere, looking for certain chemical imbalances that could hint at the presence of living organisms. For example, on Earth, the [large amount of oxygen](#) in our atmosphere is that 'smoking gun'.

We're a long way off having that much insight into GJ 1132b, but the fact that we've detected its atmosphere at all is a good first step.

The planet orbits the not-too-distant red dwarf star Gliese 1132, which Southworth and his team studied using the ESO/MPG telescope in Chile.

They measured the slight dip in brightness across seven wavelengths of light as GJ1132b passed in front of its host star every 1.6 Earth days, in order to get a better idea of the size and composition of the planet.

They were surprised to find that the planet appeared larger when observed in one type of infrared wavelength of light, which suggests that the planet has an atmosphere that's opaque to these wavelengths.

The team went on to model different possible versions of this atmosphere, and found that an atmosphere rich in water and methane could explain what they were seeing.

Prior to this, the only exoplanets that researchers have detected atmospheres around were planets that were more than eight times more massive than Earth, and gas giants similar to Jupiter.

"With this research, we have taken the first tentative step into studying the atmospheres of smaller, Earth-like, planets," [said Southworth](#). "The planet is significantly hotter and a bit larger than Earth, so one possibility is that it is a 'water world' with an atmosphere of hot steam."

The type of star GJ 1132b is orbiting also makes the planet of particular interest - its host star is a low-mass red dwarf, which are incredibly common throughout the Universe and are frequently found to host small, Earth-like planets.

But they've also been shown to be particularly active, often blasting huge solar flares out at their surrounding planets - something previous [research has suggested](#) would evaporate any traces of a planet's atmosphere.

But the new discovery suggests that an atmosphere is possible of enduring this bombardment for billions of years without being destroyed - which opens up the possibility that thousands more planets orbiting low-mass stars could potentially harbour atmospheres.

"Given the huge number of very low-mass stars and planets, this could mean that the conditions suitable for life are common in the Universe," [a press release explains](#).

We still have a lot to learn about GJ 1132b, and hopefully we'll have some more answers soon - the new discovery makes it one of the highest-priority targets to be studied by instruments such as the Hubble Space Telescope, the [Very Large Telescope](#), and the [James Webb Space Telescope](#), which is scheduled to launch in 2018.

The research has been published in [The Astronomical Journal](#).

Source: [Science Alert](#)

[Return to Contents](#)

### 3. NASA unveiled new plans for getting humans to Mars, and hardly anyone noticed

Last week, NASA did something many have demanded it do since the Space Launch System was unveiled in 2011: Provide more details on how the agency will send humans to Mars.

During two presentations to the NASA Advisory Council, associate administrator Bill Gerstenmaier showed off the latest designs for a small, Moon-orbiting space station and a larger, reusable transport ship to carry astronauts to Mars and back.

It's NASA's most concrete plan yet for sending humans back into deep space. But beyond a smattering of articles, hardly anyone noticed.

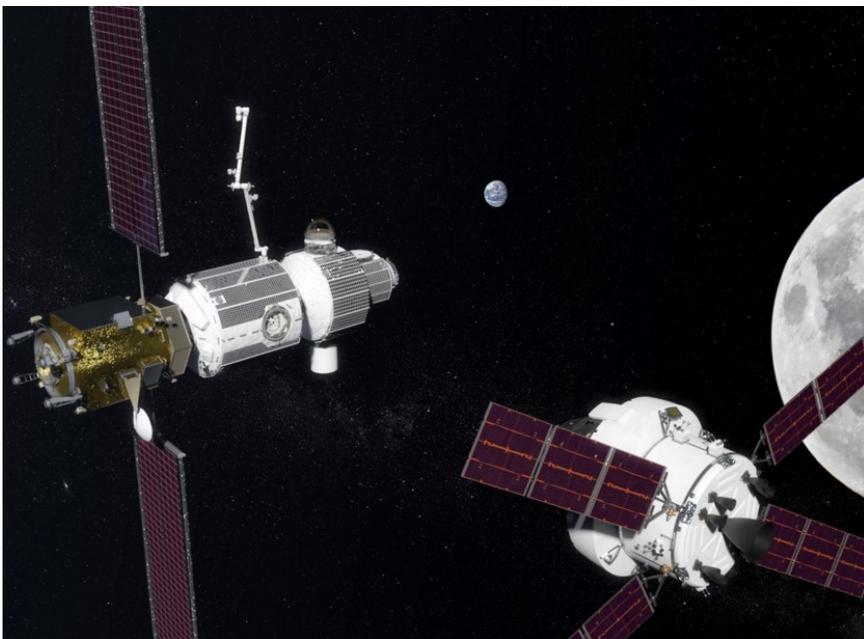
That's probably okay with Gerstenmaier. Wary of being buffeted by political winds, NASA treads lightly these days—at least, publicly. Advisory Council meetings aren't really promoted, and the agency isn't exactly shouting the plan from the rooftops, [beyond a single article that appeared on March 28](#).

[Back in 2014](#), I described NASA's deep space exploration plans like this:

There is indeed a plan to put humans on Mars. Vague? Yes. Hard to see? Absolutely. But that's because Gerst and NASA are playing the long game. And right now, it may be the only game they can play.

Three years later, the game continues. While NASA works to keep its stakeholders happy and navigate potential changes ordered by the Trump administration, Bill Gerstenmaier and the agency's human exploration directorate are busy getting the Space Launch System and Orion ready for a test flight next year. That means it's time to get serious about the next steps.

"There's now a sense of urgency," Gerstenmaier said last week. "The hope is we've created enough of a framework that folks can see that there's a real plan worth executing. But also, it's not so defined that if some piece changes, the entire plan gets thrown away and we start all over again."



**ORION APPROACHES THE DEEP SPACE GATEWAY**

*NASA's Orion spacecraft approaches the Deep Space Gateway in lunar orbit. Note the glass-domed cupola and Canadarm.*

## **Phase 1: The Deep Space Gateway**

NASA's Obama-era "Journey to Mars" slogan has largely been replaced with a more generalized mandate to expand human presence into deep space, which includes Mars. The agency still plans to spend the 2020s learning how to live and work in lunar orbit, before starting trips to Mars in the 2030s. The most noticeable change seems to be a strong emphasis on making sure international and commercial partners have lots of opportunities to participate, and leverage NASA's cislunar presence for their own programs.

That cislunar presence is modestly named "Phase 1," the core of which is a small space station called the Deep Space Gateway, or DSG.

To say the DSG is a miniature International Space Station isn't quite accurate. It isn't meant to be continually staffed; with Orion docked, it only supports a crew of four for 42 days. The DSG has a propulsion module, habitation module, and possibly an airlock for spacewalks. It will likely have an updated version of the beloved Canadarm, and possibly an advanced glass cupola offering 360-degree views of the Moon and Earth.

The DSG would be assembled by 2025, over the course of three SLS flights—each of which will launch with a crewed Orion capsule. NASA would rely on commercial or international partners for resupply flights, and a final SLS mission to bring up the airlock is notionally scheduled for 2026.

### **An attractive destination**

Building the DSG will allow NASA to practice pulling off complex deep space rendezvous, while learning to live and work where a quick return to Earth is not possible.

Another key component of the DSG is a 40-kilowatt solar-electric propulsion system. That's an order of magnitude more powerful than any SEP system operating today.

The SEP system allows the DSG to transition between an always-in-sunlight halo orbit to other orbits that could be useful for other applications, including lunar landings. That could make the new outpost an attractive destination.

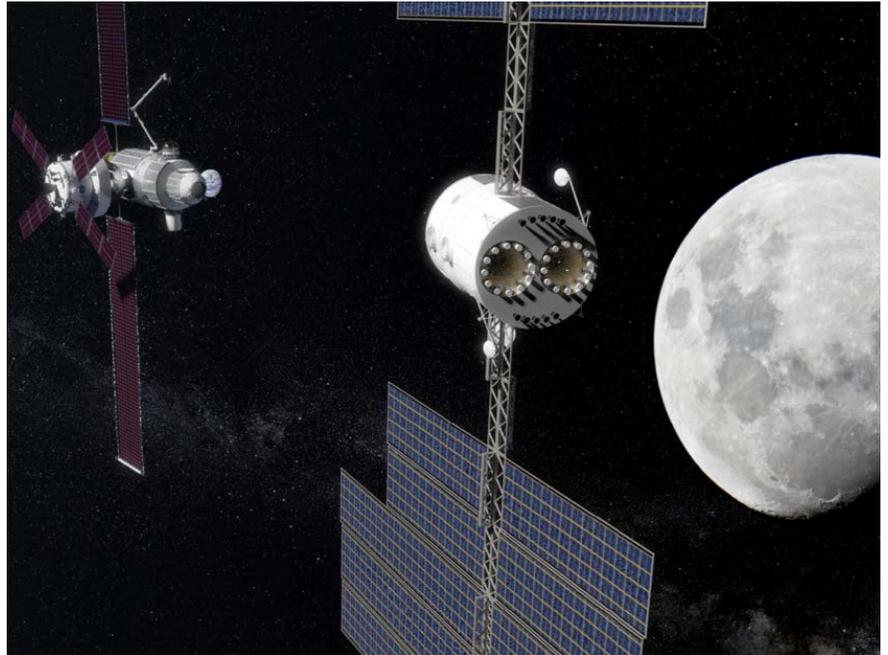
"Anyone can come and use this vehicle," Gerstenmaier said. "Both the commercial side, and international partners."

Whether or not the DSG could transition all the way to low-lunar orbit remains to be seen, due to the large change in velocity required, as well as differing power and thermal requirements caused by transiting in and out of sunlight each orbit.

"Those requirements for low-lunar orbit may be so expensive they're not worth putting in this vehicle," said Gerstenmaier. "We'll trade what the science community wants, and what the other partners want, and determine whether we want to add that capability."

## ***DEEP SPACE TRANSPORT APPROACHES THE DEEP SPACE GATEWAY***

*The Deep Space Transport (right) is a large vehicle intended to carry a crew of four astronauts on 1,000-day trips to Mars and back. Here, it approaches its port of call in lunar orbit, the Deep Space Gateway (left).*



### **Phase 2: The Deep Space Transport**

Once phase 1 is complete, NASA will move onto phase 2, during which the DSG becomes a lunar port of call for a large crew vehicle called the Deep Space Transport, or DST.

The DST supports a crew of four for 1,000 days at a time. Between each trip, it will be resupplied, refurbished and refueled at the DSG. NASA expects it to be long-lived enough for a total of three round trips to Mars.

The vehicle could be Skylab-esque in volume. International Space Station modules like Unity have a [diameter of 4.3 meters](#). Skylab, essentially the size of a Saturn V rocket's upper stage, was [6.6 meters wide](#)—wide enough to allow astronauts to float in the center without touching the walls. SLS has a fairing diameter of 8.4 meters, and NASA says the DST will take "full advantage of the large volumes and mass that can be launched by the SLS rocket."

The DST is heavy, too—NASA predicts a mass of 41 metric tons, without supplies. A single SLS cargo flight would carry it to lunar orbit in 2027.

"There's really no (other) vehicle today, or even planned, that can launch 41 metric tons (to the Moon) in one piece," Gerstenmaier said. "We think that that is the minimum size for this Mars-class transport."

The closest contender is SpaceX's upcoming Falcon Heavy launcher. The rocket is advertised as being able to heave 64 metric tons into low-Earth orbit, but there is no reliable public estimate on how much mass it can send to the Moon. ([An article by Universe Today last year](#) suggested 13 metric tons, which is the same capability SpaceX is projecting for Mars.)

### **All or nothing**

NASA's all-in-one-launch approach for the Deep Space Transport actually resembles [SpaceX's far-flung plan to send a million people to Mars](#).

That plan envisions launching 100 people into Earth orbit atop a behemoth rocket powered by 42 engines. SpaceX, having no on-orbit assembly experience, doesn't seem to be interested in smaller rockets and numerous launches. NASA, despite having almost 20 years of experience with the ISS, isn't favoring that approach either.

In NASA's case, Gerstenmaier said the single-launch approach saves weight, since assembling multiple components requires extra berthing ports and internal hatches. The agency also has the Space Launch System at its disposal, and likely wants to avoid the cost of a multi-mission assembly project.

After receiving supplies and equipment at the DSG, the DST would be ready to fly. In 2029, a crew would climb aboard for a one-year shakedown cruise, during which the DST would fly on its own in lunar orbit. Assuming everything goes smoothly, the DST would return to the DSG (still following the acronyms?) for refueling and supplies, before embarking on its first crewed flight to Mars orbit in 2033.

The journey might involve a Venus gravity assist, in which case the chosen crewmembers would get to see the clouds of Venus and volcanoes of Mars all in the same trip—with their own eyes.

Source: [Planetary Society](#)

[Return to Contents](#)

# The Night Sky

## Friday, April 7

- Jupiter is at opposition: in the opposite direction from the Sun as seen from Earth. It climbs into grand view in the southeast through the evening, with slightly bluer Spica below it.

This is, however, Jupiter's most distant opposition since 2005; it's magnitude  $-2.5$  and in a telescope appears 44.2 arcseconds across its equator. Jupiter reaches almost 50" wide at the maxima of its opposition cycle. This last occurred in 2010 and will again in 2022.

## Saturday, April 8

- Vega, the bright "Summer Star," rises in the northeast not long after dark now. Where should you watch for it to come up? Spot the Big Dipper almost overhead in the northeast. Look at Mizar at the bend of the Dipper's handle. If you can see Mizar's tiny, close companion Alcor (binoculars make it easy), follow a line from Mizar through Alcor all the way down to the horizon. That's where Vega makes its appearance.

## Sunday, April 9

- Right after dark, Orion is still well up in the west-southwest in his spring orientation: striding down to the right, with his belt horizontal. The belt points left toward Sirius and right toward Aldebaran and, farther on, the Pleiades.

## Monday, April 10

- Full Moon (exactly full at 2:08 a.m. tonight EDT; 11:08 p.m. PDT.) The Moon shines near Jupiter all night, as shown at right, since they're both near or at their oppositions. They may look like companions, but Jupiter is 1,700 times farther away — and 40 times larger in diameter.

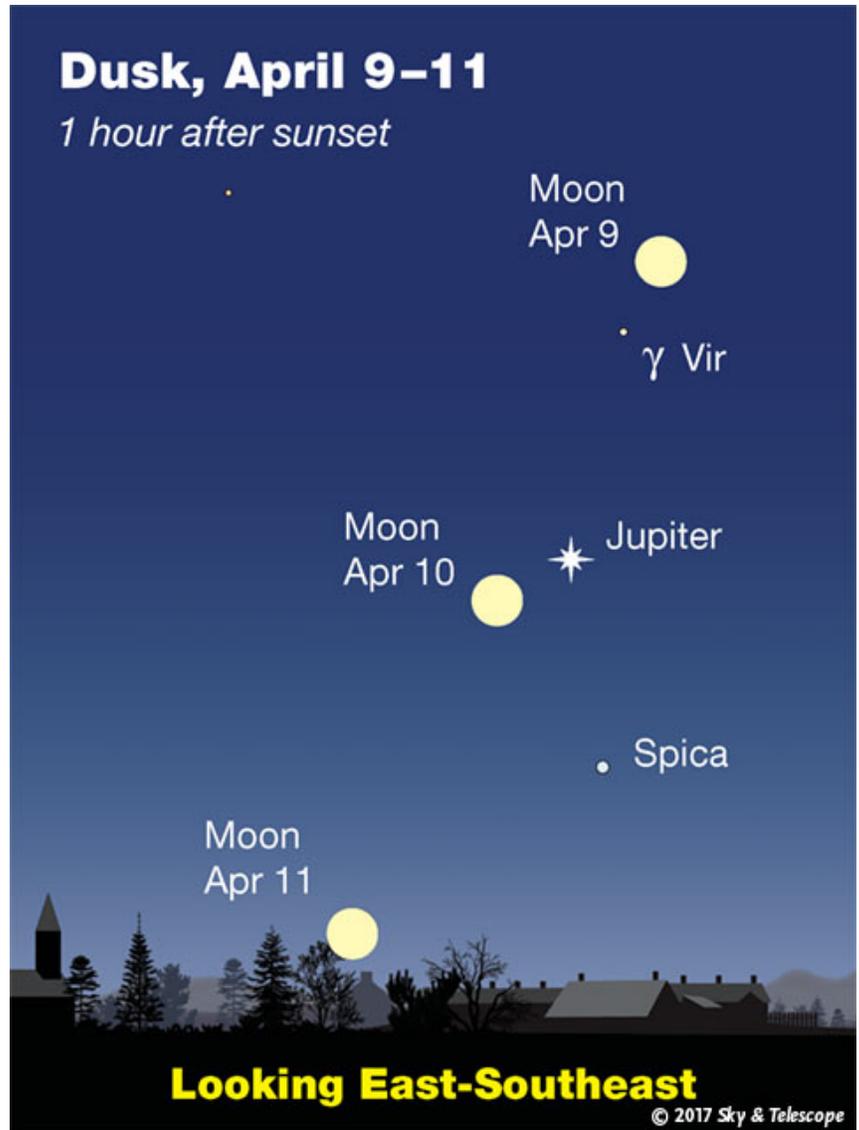
Spica, about  $7^\circ$  below them in the evening, is 3.7 million times more distant than Jupiter — though it has only 70 or 80 times Jupiter's diameter.

## Tuesday, April 11

- At this time of year, the two Dog Stars stand vertically aligned around the end of twilight. Look southwest. Brilliant Sirius in Canis Major is below, and Procyon in Canis Minor is high above.

Source: [Sky & Telescope](#)

[Return to Contents](#)



# ISS Sighting Opportunities

[For Denver:](#)

Date	Visible	Max Height	Appears	Disappears
Fri Apr 7, 8:03 PM	1 min	10°	10° above N	10° above NNE
Fri Apr 7, 9:39 PM	1 min	18°	11° above NNW	18° above N
Sat Apr 8, 8:47 PM	3 min	15°	10° above NNW	13° above NE
Sun Apr 9, 7:56 PM	3 min	12°	10° above N	10° above NE
Sun Apr 9, 9:32 PM	1 min	34°	18° above NNW	34° above N
Mon Apr 10, 8:39 PM	4 min	24°	11° above NNW	17° above ENE
Mon Apr 10, 10:16 PM	< 1 min	14°	12° above WNW	14° above WNW
Tue Apr 11, 9:25 PM	1 min	60°	29° above NW	60° above WNW

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

## NASA-TV Highlights

(all times Eastern Daylight Time)

**4 p.m., 8 p.m., Friday, April 7** - SpaceCast Weekly (all channels)

**8 a.m., 2 p.m., Saturday, April 8** - SpaceCast Weekly (all channels)

**9 a.m., 6 p.m., Saturday, April 8** - Replay of the NASA News Briefing – Cassini Grand Finale Preview (all channels)

**10 a.m., 7 p.m., Saturday, April 8** - Replay of the ISS Expedition 51-52 Crew (Fischer and Yurchikhin) News Conference at the Gagarin Cosmonaut Training Center in Star City, Russia (all channels)

**4 p.m., 8 p.m., Saturday, April 8** - Replay of the NASA Television Video File Feed of the ISS Expedition 51-52 Crew's (Fischer, Yurchikhin) Departure from the Gagarin Cosmonaut Training Center in Star City, Russia for the Baikonur Cosmodrome in Kazakhstan (all channels)

**10:30 a.m., 3 p.m., 7 p.m., Sunday, April 9** - ISS Expedition 50/51 Change of Command Ceremony (Kimbrough hands over ISS Command to Whitson) (Starts at 10:40a.m.) (all channels)

**1 p.m., 6 p.m., Sunday, April 9** - SpaceCast Weekly (all channels)

**2 p.m., 9 p.m., Sunday, April 9** - Replay of the NASA News Briefing – Cassini Grand Finale Preview (all channels)

**4 p.m., 8 p.m., Sunday, April 9** - Replay of the NASA Television Video File Feed of the ISS Expedition 51-52 Crew's (Fischer, Yurchikhin) Departure from the Gagarin Cosmonaut Training Center in Star City, Russia for the Baikonur Cosmodrome in Kazakhstan (all channels)

**11 p.m., Sunday, April 9** - Replay of the ISS Expedition 50/51 Change of Command Ceremony (Kimbrough hands over ISS Command to Whitson) (all channels)

**Midnight, Monday, April 10** - ISS Expedition 50 Farewells and Hatch Closure Coverage (Ryzhikov, Borisenko, Kimbrough); hatch closure scheduled at appx. 12:40 a.m. ET) (starts at 12:15 a.m.) (all channels)

**3:30 a.m., Monday, April 10** - ISS Expedition 50/Soyuz MS-02 Undocking Coverage (Ryzhikov, Borisenko, Kimbrough); undocking scheduled at 3:57 a.m. ET) (all channels)

**6 a.m., Monday, April 10** - ISS Expedition 50/Soyuz MS-02 Deorbit Burn and Landing Coverage (Ryzhikov, Borisenko, Kimbrough); deorbit burn scheduled at 6:28 a.m. ET; landing near Dzhezkazgan, Kazakhstan scheduled at 7:21 a.m. ET) (all channels)

**9 a.m., 11 a.m., 3 p.m., 7 p.m., 11 p.m., Monday, April 10** - Video File of the ISS Expedition 50/Soyuz MS-02 Landing and Post-Landing Activities (Ryzhikov, Borisenko, Kimbrough) (all channels)

**12 p.m., 4 p.m., 8 p.m., 10 p.m., Tuesday, April 11** - Video File of the ISS Expedition 50/Soyuz MS-02 Post-Landing Activities in Kazakhstan and Interview; scheduled to include a post-landing interview with ISS Expedition 50 Commander Shane Kimbrough of NASA and the return of cosmonauts Sergey Ryzhikov and An (all channels)

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

[Return to Contents](#)

# Space Calendar

- Apr 07 - [Moon Occults Regulus](#)
- Apr 07 - [Moon Occults Asteroid 16 Psyche](#)
- Apr 07 - [Jupiter At Opposition](#)
- Apr 07 - [Comet 73P-AH/Schwassmann-Wachmann Perihelion](#) (0.973 AU)
- Apr 07 - [Comet 245P/WISE Closest Approach To Earth](#) (2.207 AU)
- Apr 07 - [Comet 329P/LINEAR-Catalina At Opposition](#) (3.594 AU)
- Apr 07 - [Comet 215P/NEAT At Opposition](#) (3.655 AU)
- Apr 07 - **NEW** [Mar 31] [Apollo Asteroid 2017 FS102](#) Near-Earth Flyby (0.020 AU)
- Apr 07 - [Apollo Asteroid 2017 FN101](#) Near-Earth Flyby (0.026 AU)
- Apr 07 - [Asteroid 4464 Vulcano](#) Closest Approach To Earth (1.034 AU)
- Apr 07 - [Asteroid 27596 Maldives](#) Closest Approach To Earth (2.048 AU)
- Apr 07 - [Asteroid 13586 Copenhagen](#) Closest Approach To Earth (2.061 AU)
- Apr 07 - [Meeting: Science with Cubesats](#), London, United Kingdom
- Apr 08 - [Comet 104P/Kowal Closest Approach To Earth](#) (2.636 AU)
- Apr 08 - [Comet C/2016 E1 \(PANSTARRS\) At Opposition](#) (7.346 AU)
- Apr 08 - **NEW** [Apr 07] [Amor Asteroid 2017 GS5](#) Near-Earth Flyby (0.059 AU)
- Apr 08 - [Amor Asteroid 2017 FQ101](#) Near-Earth Flyby (0.070 AU)
- Apr 08 - **NEW** [Apr 07] [Amor Asteroid 2017 GM5](#) Near-Earth Flyby (0.079 AU)
- Apr 08 - [Apollo Asteroid 2017 FE3](#) Near-Earth Flyby (0.081 AU)
- Apr 08 - [Aten Asteroid 2016 GH135](#) Near-Earth Flyby (0.088 AU)
- Apr 08 - [Asteroid 3904 Honda](#) Closest Approach To Earth (1.718 AU)
- Apr 08 - [Kuiper Belt Object 2013 FS28](#) At Opposition (84.431 AU)
- Apr 08 - [Educator Workshop: Rockets and Flight](#), Pasadena, California
- Apr 08 - 15th Anniversary (2002), [STS-110](#) Launch (Space Shuttle Atlantis, International Space Station)
- Apr 08 - [David Rittenhouse's 285th Birthday](#) (1732)
- Apr 09 - **HOT** [Apr 03] [CRS-11/ NICER/ CREAM](#) Falcon 9 Launch (International Space Station)
- Apr 09 - [Comet 73P-BL/Schwassmann-Wachmann Closest Approach To Earth](#) (0.597 AU)
- Apr 09 - [Comet 73P-AN/Schwassmann-Wachmann Perihelion](#) (0.969 AU)
- Apr 09 - [Comet 267P/LONEOS At Opposition](#) (2.977 AU)
- Apr 09 - [Centaur Object 10199 Chariklo Occults UCAC4-294-211208](#) (14.9 Magnitude Star)
- Apr 09 - **NEW** [Apr 05] [Apollo Asteroid 2017 GT4](#) Near-Earth Flyby (0.009 AU)
- Apr 09 - **NEW** [Apr 03] [Apollo Asteroid 2017 FS128](#) Near-Earth Flyby (0.067 AU)
- Apr 09 - [Asteroid 7984 Marius](#) Closest Approach To Earth (2.153 AU)
- Apr 09 - [Asteroid 1213 Algeria](#) Closest Approach To Earth (2.572 AU)
- Apr 09 - [Fabrizio Bernardi's 45th Birthday](#) (1972)
- Apr 10 - **HOT** [Apr 03] [Soyuz MS-2](#) Return to Earth (International Space Station)
- Apr 10 - [Comet C/2017 E1 \(Borisov\) Perihelion](#) (0.900 AU)
- Apr 10 - [Comet 73P-L/Schwassmann-Wachmann Perihelion](#) (0.969 AU)
- Apr 10 - [Comet 73P-X/Schwassmann-Wachmann Perihelion](#) (0.969 AU)
- Apr 10 - [Comet 141P-D/Machholz At Opposition](#) (3.732 AU)
- Apr 10 - [Comet 141P/Machholz At Opposition](#) (3.756 AU)
- Apr 10 - [Comet 141P-A/Machholz At Opposition](#) (3.756 AU)
- Apr 10 - [Comet C/2016 E1 \(PANSTARRS\) Closest Approach To Earth](#) (7.345 AU)
- Apr 10 - [Asteroid 216 Kleopatra Occults TYC 5738-02638-1](#) (11.2 Magnitude Star)
- Apr 10 - [Aten Asteroid 3554 Amun Closest Approach To Earth](#) (0.936 AU)
- Apr 10 - [Asteroid 5405 Neverland](#) Closest Approach To Earth (1.300 AU)
- Apr 10 - [Asteroid 96205 Ararat](#) Closest Approach To Earth (1.864 AU)
- Apr 10 - [Asteroid 5760 Mittlefehldt](#) Closest Approach To Earth (2.069 AU)

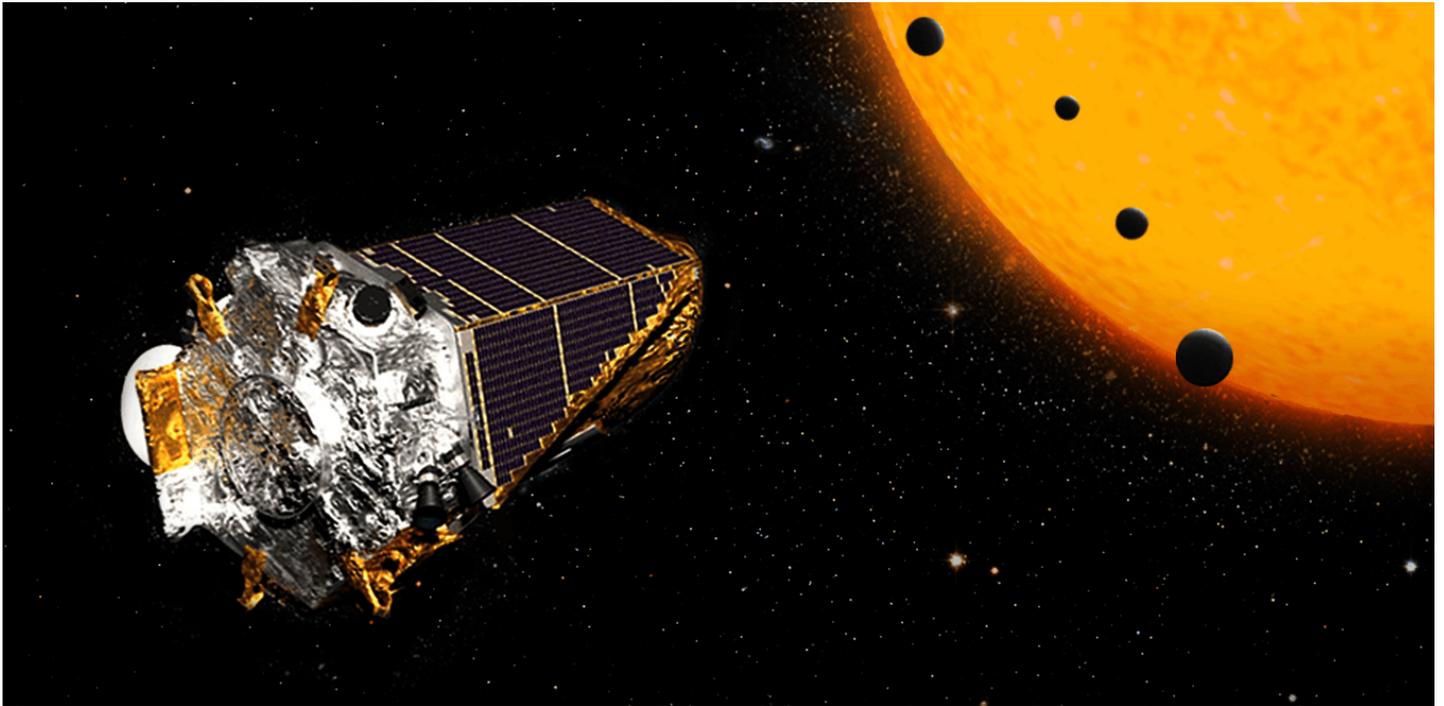
- Apr 10 - [Asteroid 1388 Aphrodite](#) Closest Approach To Earth (2.124 AU)
- Apr 10 - [Asteroid 20469 Dudleymoore](#) Closest Approach To Earth (2.192 AU)
- Apr 10 - Vincenzo Ferraro's 115th Birthday (1902)
- Apr 10 - 1180th Anniversary (837 AD), [Comet Halley's](#) Known Closest Approach to Earth (3 Million Miles)
- Apr 11 - [Comet 230P/LINEAR At Opposition](#) (3.110 AU)
- Apr 11 - [Comet C/2017 D3 \(ATLAS\) At Opposition](#) (4.023 AU)
- Apr 11 - [Comet 206P/Barnard-Boattini At Opposition](#) (4.299 AU)
- Apr 11 - [Asteroid 17427 Poe](#) Closest Approach To Earth (2.848 AU)
- Apr 11 - [Wes Huntress'](#) 75th Birthday (1942)
- Apr 11 - [Anatoly Berezovoy's](#) 75th Birthday (1942)
- Apr 11 - [William Campbell's](#) 155th Birthday (1862)

Source: [JPL Space Calendar](#)

[Return to Contents](#)

## Food for Thought

Exoplanet discovery by an amateur astronomer shows the power of citizen science



You don't need to be a professional astronomer to find new worlds orbiting distant stars. Darwin mechanic and amateur astronomer Andrew Grey this week helped to [discover a new exoplanet system](#) with at least four orbiting planets.

But Andrew did have professional help and support.

The [discovery](#) was a highlight moment of this week's three-evening special [ABC Stargazing Live](#), featuring British physicist [Brian Cox](#), presenter [Julia Zemiro](#) and others.

Viewers were encouraged to join in the search for exoplanets – planets orbiting distant stars – using the [Exoplanet Explorers](#) website. After a quick tutorial they were then asked to trawl through data on thousands of stars recently observed with NASA's [Kepler Space Telescope](#).

Grey checked out more than 1,000 stars on the website before discovering the characteristic dips in brightness of the star in the data that signify an exoplanet.

Together with other co-discoverers, Grey's name will appear on a scientific paper reporting the very significant discovery of a star with four planets, orbiting closer to the star than Mercury is to our Sun.

[Grey told Stargazing Live:](#)

"That is amazing. Definitely my first scientific publication ... just glad that I can contribute. It feels very good."

Cox was clearly impressed by the new discovery:

"In the seven years I've been making Stargazing Live this is the most significant scientific discovery we've ever made."

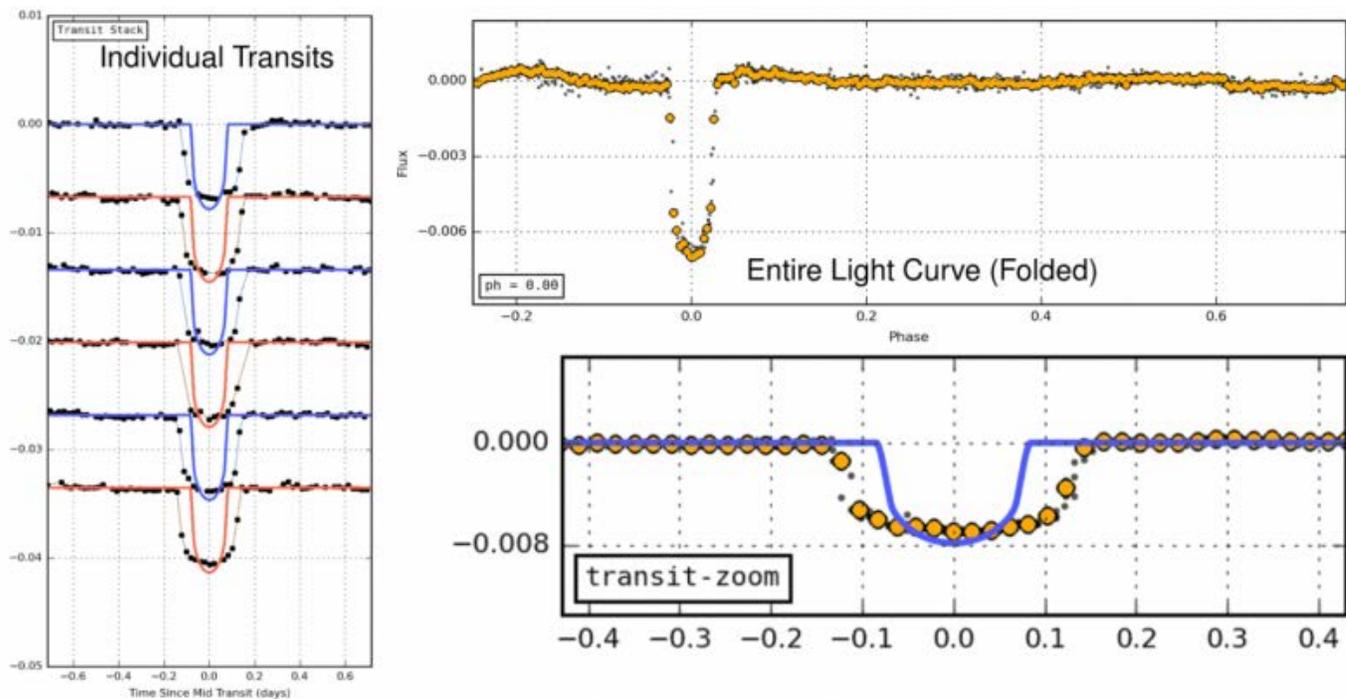
## A breakthrough for citizen science

So just what does this discovery signify? First, let's be clear: this is no publicity stunt, or a bit of fake news dressed up to make a good story.

This is a real scientific discovery, to be reported in the scientific literature like other discoveries made by astronomers.

It will help us understand the formation of our own Earth. It's also a step towards establishing whether we are alone in the universe, or whether there are other planets populated by other civilisations.

On the other hand, it must be acknowledged that this discovery joins the list of [more than 2,300 known exoplanets](#) discovered by Kepler so far. There are thousands more candidate planets to be examined.



*As the planet passes in front of the star, it hides part of the star, causing a characteristic dip in brightness.*  
Credit: ABC/Zooniverse

If Grey and his colleagues hadn't discovered this new planetary system, then somebody else would have eventually discovered it. But that can be said of all discoveries. The fact remains that this particular discovery was made by Grey and his fellow [citizen scientists](#).

## Amateurs and professionals working together

I think that the greatest significance of this discovery is that it heralds a change in the way we do science.

As I said earlier, Grey didn't make this discovery alone. He used data from the Kepler spacecraft with a [mission cost of US\\$600 million](#).

Although we can build stunning telescopes that produce vast amounts of valuable data, we can't yet build an algorithm that approaches the extraordinary abilities of the [human brain](#) to examine that data.

A human brain can detect patterns in the data far more effectively than any machine-learning algorithm yet devised. Because of the large volume of data generated by Kepler and other scientific instruments, we need large teams of human brains – larger than any research lab.

But the brains don't need to be trained astrophysicists, they just need to have the amazing cognitive abilities of the human brain.

This results in a partnership where big science produces data, and [citizen](#) scientists inspect the data to help make discoveries. It means that anyone can be involved in cutting-edge science, accelerating the growth of human knowledge.

## **A gathering of brainpower**

This is happening all over science and even the arts, from [butterfly hunting](#) to [transcribing Shakespeare's handwriting](#).

Last year citizen scientists in the Australian-led [Radio Galaxy Zoo](#) project discovered the largest known cluster of galaxies.

None of these projects would be possible without widespread access to the internet, and readily-available tools to build [citizen science](#) projects, such as the [Zooniverse](#) project.

Will machines ever make citizen scientists redundant? I have argued before that we need to build algorithms called "machine scientists" to make future discoveries from the vast volumes of data we are generating.

But these algorithms still need to be trained by humans. The larger our human-generated training set, the better our machine scientists will work.

So rather than making citizen scientists redundant, the machine scientists multiply the power of citizen scientists, so that a discovery made by a future Andrew Grey may result in hundreds of discoveries by machines trained using his discovery.

I see the power of citizen scientists continuing to grow. I suspect this is only the start. We can do much more. We can increase the "fun" of doing citizen science by introducing "gaming" elements into citizen science programs, or by taking advantage of new technologies such as augmented reality and immersive virtual reality.

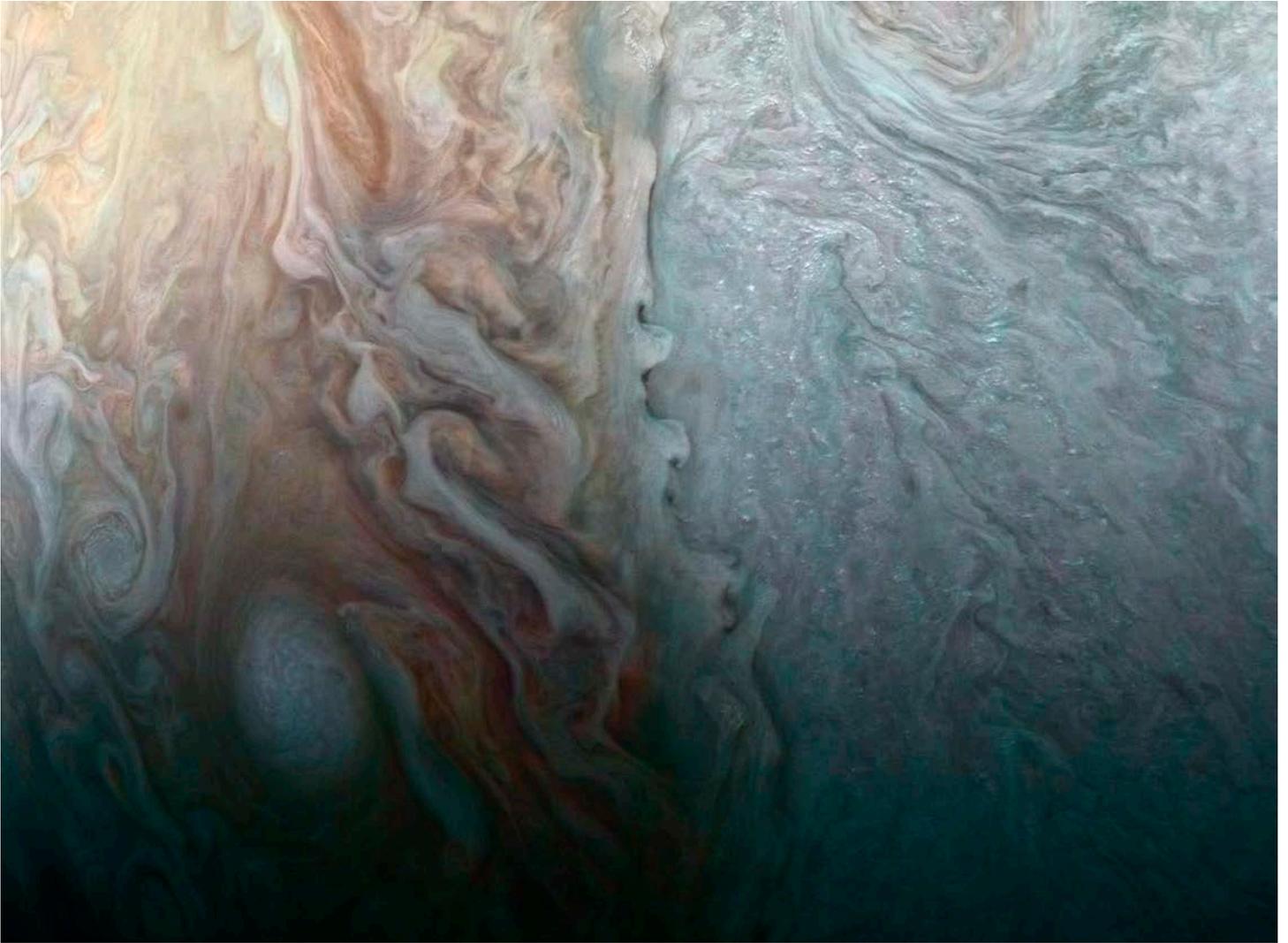
Perhaps we can tap into other human qualities such as imagination and creativity to achieve goals that still frustrate machines.

I look forward to the day when a Nobel prize is won by someone in a developing country without access to a traditional university education, but who uses the power of their mind, the wealth of information on the web and the tools of citizen science to transcend the dreams of traditional [science](#).

Source: [Phys.org](#)

[Return to Contents](#)

## Space Image of the Week



### **When Jovian Light and Dark Collide**

This image, taken by the JunoCam imager on NASA's Juno spacecraft, highlights a feature on Jupiter where multiple atmospheric conditions appear to collide.

This [publicly selected target](#) is called "STB Spectre." The ghostly bluish streak across the right half of the image is a long-lived storm, one of the few structures perceptible in these whitened latitudes where the south temperate belt of Jupiter would normally be. The egg-shaped spot on the lower left is where incoming small dark spots make a hairpin turn.

The image was taken on March 27, 2017, at 2:06 a.m. PDT (5:06 a.m. EDT), as the Juno spacecraft performed a close flyby of Jupiter. When the image was taken, the spacecraft was 7,900 miles (12,700 kilometers) from the planet.

The image was processed by Roman Tkachenko, and the description is from John Rogers, the citizen scientist who identified the point of interest. JunoCam's raw images are available for the public to peruse and process into image products at:

[www.missionjuno.swri.edu/junocam](http://www.missionjuno.swri.edu/junocam)

Source: [NASA](#)

[Return to Contents](#)