

# Space News Update

– February 21, 2017 –

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## 1. NASA's Pad 39A Back in Business with SpaceX Falcon 9 Launch



After a six year lull NASA's [historic pad 39A](#) roared back to business this morning (Feb. 20) with the dramatic maiden blastoff of a SpaceX Falcon 9 rocket, on a critical cargo delivery mission for NASA to the space station – while simultaneously landing the first stage back on the ground at the Cape on a secondary mission aimed at one day propelling humans to Mars.

The era of undesired idleness for America's most famous launch pad was broken at last by the rumbling thunder of a SpaceX Falcon 9 that ignited at 9:38 a.m. EST Sunday morning, Feb 19, at Launch Complex 39A at NASA's Kennedy Space Center.

The storied liftoff took place under heavily overcast skies with rain showers nearby under seemingly improbable weather conditions.

After liftoff, the rocket disappeared within seconds and never really reappeared in the local area until the final moments of the descent of the first stage – which nailed a nearly perfect dead center touchdown at Landing Zone 1 at the Cape some 9 minutes after launch.

And it was SpaceX's first daylight booster landing back at the Cape. The two earlier touchdowns were at night – most recently for the CRS-9 mission last summer in July 2016.

The goal of the mission was aimed at launching the SpaceX Dragon cargo freighter to deliver over 5500 pounds of science and supplies to the orbiting science outpost on the CRS-10 mission.

The Dragon spacecraft was successfully delivered in Earth orbit and is on course for the International Space Station (ISS) on the CRS-10 mission.

As a secondary side goal, SpaceX successfully carried out a propulsive soft landing of the 156 foot tall first stage of the Falcon 9 rocket on land at Cape Canaveral Air Force Station's Landing Zone 1 (LZ-1), located about 9 miles south of KSC launch complex 39A.

The touchdown, like the launch was completely obscured until the final moments of the descent, when it suddenly and magnificently reappeared as a strange pale colored cylinder emitting a long yellow flame after dropping below the low hanging clouds.

The booster successfully accomplished a propulsive upright soft landing at Landing Zone-1 (LZ-1) accompanied by multiple sonic booms at Cape Canaveral Air Force Station, Florida, about 9 minutes after launch.

This was the 8th first stage booster that SpaceX has successfully recovered either by land or on a tiny dronship at sea over the past year.

The dream of Bob Cabana, former astronaut and now Center Director at the Kennedy Space Center NASA's, to turn KSC into a multiuser spaceport open to utilization by government, industry and entrepreneurs like SpaceX's billionaire CEO Elon Musk is finally coming to fruition in a blaze of glory.

"I'm so proud of this team for all the dedication and hard work," said Cabana.

Today's launch counts as the first commercial launch from Kennedy's historic pad.

The storied pad initially sent NASA astronauts to the Moon soon after the dawn of the Space Age during the Apollo/Saturn era and was then significantly overhauled to serve as the on ramp for NASA space shuttles for another three decades.

SpaceX has now transformed pad 39A for launches of the Falcon 9. A bright future lies ahead with launches of the heavy lift Falcon Heavy later this year and a renewal of manned launches of astronauts some time in 2018.

Dragon is carrying more than 5500 pounds of equipment, gear, food, crew supplies, hardware and NASA's Stratospheric Aerosol Gas Experiment III (SAGE III) ozone mapping science payload in support of the Expedition 50 and 51 crew members.

SAGE III will measure stratospheric ozone, aerosols, and other trace gases by locking onto the sun or moon and scanning a thin profile of the atmosphere.

The LIS lightning mapper will measure lightning from the altitude of the ISS. NASA's RAVEN experiment will test autonomous docking technologies for spacecraft.

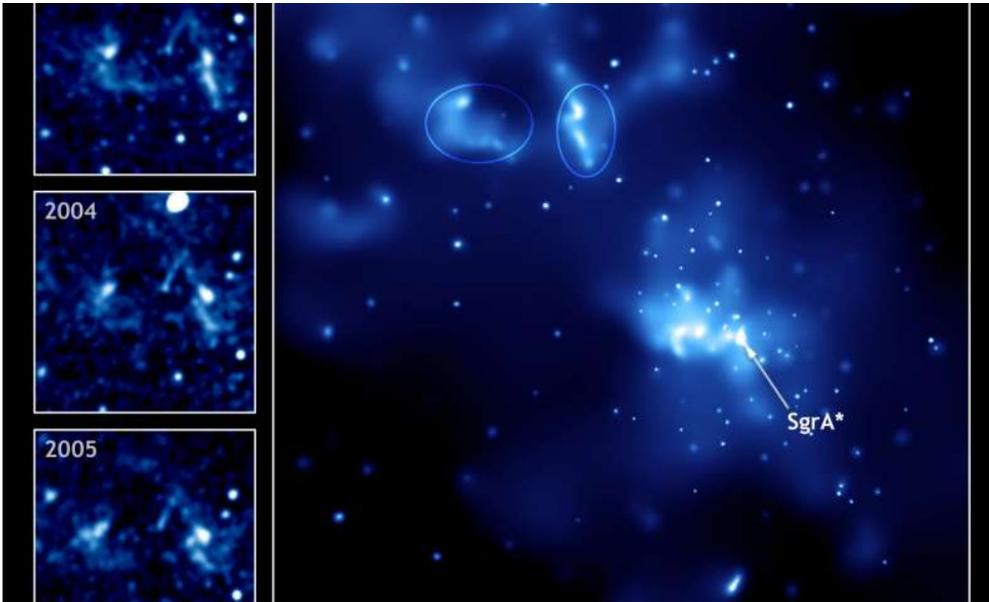
The research supplies and equipment brought up by Dragon will support over 250 scientific investigations to advance knowledge about the medical, psychological and biomedical challenges astronauts face during long-duration spaceflight.

As of today we are at last launching rockets again from the Kennedy Space Center – thanks to SpaceX and the Falcon 9. What a tremendous return to space!

Source: [Ken Kramer-Universe Today](#)

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## 2. Scientists readying to create first image of a black hole



A team of researchers from around the world is getting ready to create what might be the first image of a black hole. The project is the result of collaboration between teams manning radio receivers around the world and a team at MIT that will assemble the data from the other teams and hopefully create an image.

The project has been ongoing for approximately 20 years as project members have sought to piece together what has now become known as the Event Horizon Telescope (EHT). Each of the 12 participating [radio](#) receiving teams will use equipment that has been installed for the project to record data received at a frequency of 230GHz during April 5 through the 14<sup>th</sup>. The data will be recorded onto hard drives which will all be sent to MIT Haystack Observatory in Massachusetts, where a team will stitch the data together using a technique called very long baseline array interferometry—in effect, creating the illusion of a single radio telescope as large as the Earth. The black hole they will all focus on is the one believed to be at the center of the Milky Way galaxy—Sagittarius A\*.

A black hole cannot be photographed, of course, light cannot reflect or escape from it, thus, there would be none to capture. What the team is hoping to capture is the light that surrounds the black hole at its [event horizon](#), just before it disappears.

Sagittarius A\* is approximately 26,000 light-years from Earth and is believed to have a mass approximately four million times greater than the sun—it is also believed that its event horizon is approximately 12.4 million miles across. Despite its huge size, it would still be smaller than a pin prick against our night sky, hence the need for the array of radio telescopes.

The researchers believe the image that will be created will be based on a ring around a black blob, but because of the Doppler effect, it should look to us like a crescent. Processing at Haystack is expected to take many months, which means we should not expect to see an image released to the press until sometime in 2018.

More information: [www.eventhorizontelescope.org/](http://www.eventhorizontelescope.org/)

Source: [Phys.org](http://Phys.org)

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### 3. Dawn Discovers Evidence for Organic Material on Ceres



NASA's Dawn mission has found evidence for organic material on Ceres, a dwarf planet and the largest body in the main asteroid belt between Mars and Jupiter. Scientists using the spacecraft's visible and infrared mapping spectrometer (VIR) detected the material in and around a northern-hemisphere crater called Ernutet. Organic molecules are interesting to scientists because they are necessary, though not sufficient, components of life on Earth.

The discovery adds to the growing list of bodies in the solar system where organics have been found. Organic compounds have been found in certain meteorites as well as inferred from telescopic observations of several asteroids. Ceres shares many commonalities with meteorites rich in water and organics -- in particular, a meteorite group called carbonaceous chondrites. This discovery further strengthens the connection between Ceres, these meteorites and their parent bodies.

"This is the first clear detection of organic molecules from orbit on a main belt body," said Maria Cristina De Sanctis, lead author of the study, based at the National Institute of Astrophysics, Rome. The discovery is reported in the journal *Science*.

Data presented in the *Science* paper support the idea that the organic materials are native to Ceres. The carbonates and clays previously identified on Ceres provide evidence for chemical activity in the presence of

water and heat. This raises the possibility that the organics were similarly processed in a warm water-rich environment.

## **Significance of organics**

The organics discovery adds to Ceres' attributes associated with ingredients and conditions for life in the distant past. Previous studies have found hydrated minerals, carbonates, water ice, and ammoniated clays that must have been altered by water. Salts and sodium carbonate, such as those found in the bright areas of Occator Crater, are also thought to have been carried to the surface by liquid.

"This discovery adds to our understanding of the possible origins of water and organics on Earth," said Julie Castillo-Rogez, Dawn project scientist based at NASA's Jet Propulsion Laboratory in Pasadena, California.

## **Where are the organics?**

The VIR instrument was able to detect and map the locations of this material because of its special signature in near-infrared light.

The organic materials on Ceres are mainly located in an area covering approximately 400 square miles (about 1,000 square kilometers). The signature of organics is very clear on the floor of Ernutet Crater, on its southern rim and in an area just outside the crater to the southwest. Another large area with well-defined signatures is found across the northwest part of the crater rim and ejecta. There are other smaller organic-rich areas several miles (kilometers) west and east of the crater. Organics also were found in a very small area in Inamahari Crater, about 250 miles (400 kilometers) away from Ernutet.

In enhanced visible color images from Dawn's framing camera, the organic material is associated with areas that appear redder with respect to the rest of Ceres. The distinct nature of these regions stands out even in low-resolution image data from the visible and infrared mapping spectrometer.

"We're still working on understanding the geological context for these materials," said study co-author Carle Pieters, professor of geological sciences at Brown University, Providence, Rhode Island.

## **Next steps for Dawn**

Having completed nearly two years of observations in orbit at Ceres, Dawn is now in a highly elliptical orbit at Ceres, going from an altitude of 4,670 miles (7,520 kilometers) up to almost 5,810 miles (9,350 kilometers). On Feb. 23, it will make its way to a new altitude of around 12,400 miles (20,000 kilometers), about the height of GPS satellites above Earth, and to a different orbital plane. This will put Dawn in a position to study Ceres in a new geometry. In late spring, Dawn will view Ceres with the sun directly behind the spacecraft, such that Ceres will appear brighter than before, and perhaps reveal more clues about its nature.

Source: [JPL](#)

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# The Night Sky

## Tuesday, February 21

- This is a fine week to look for the [zodiacal light](#) if you live in the northern latitudes, now that the evening sky is moonless and the ecliptic tilts high upward from the west horizon at nightfall. From a clear, clean, wide-open dark site, look west at twilight's very end for a vague but huge, tall pyramid of pearly light. It's tilted to the left, aligning along the constellations of the zodiac: through Venus and up between Aldebaran and the Pleiades.

What you're seeing is sunlit interplanetary dust orbiting the Sun near the ecliptic plane. Believe it or not, seen from interstellar distances this would be the solar system's brightest feature after the Sun itself. The "zodiacal lights" of dust around other stars may be a real obstacle to someday seeing their small, terrestrial planets.

## Wednesday, February 22

- Carnivores emerge from hibernation. After dinnertime at this time of year, five carnivore constellations are rising upright in a ragged row from the northeast to south. They're all seen in profile with their noses pointed up and their feet (if any) to the right. These are Ursa Major in the northeast (with the Big Dipper as its brightest part), Leo in the east, Hydra the Sea Serpent in the southeast, Canis Minor higher in the south-southeast, and bright Canis Major in the south.

- Algol should be at minimum light, magnitude 3.4 instead of its usual 2.3, for a couple hours centered on 9:39 p.m. EST. It takes several more hours before and after to fade and rebrighten. [Comparison-star chart](#), with star magnitudes given to the nearest tenth.

## Thursday, February 23

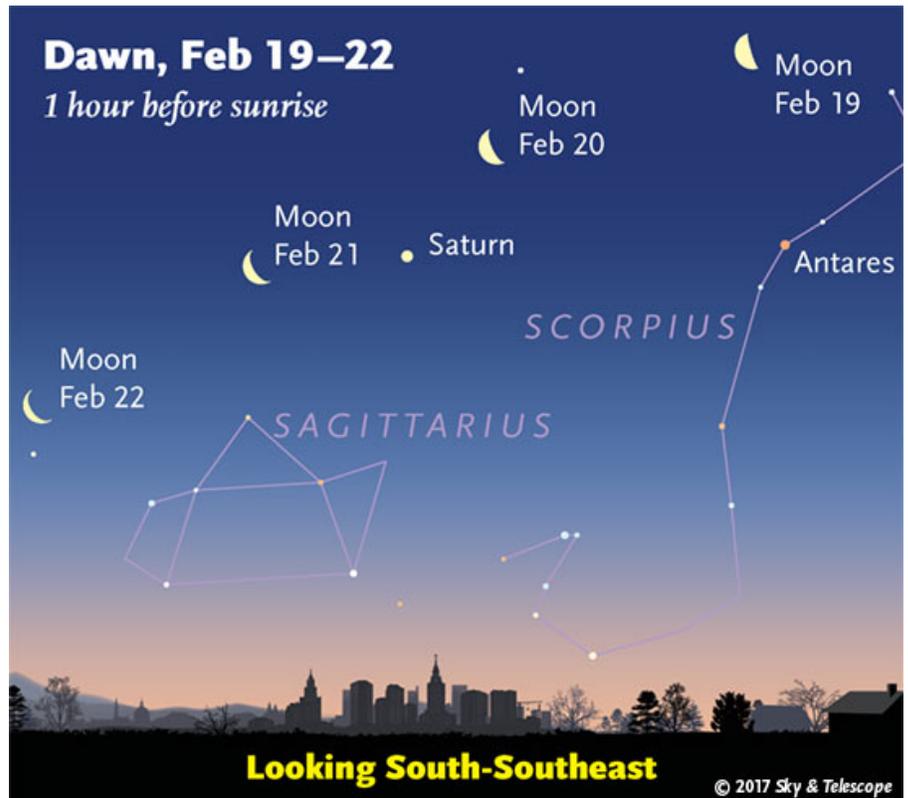
- Certain deep-sky objects contain secret surprises within or near them. Get out your telescope and sky atlas for a go at Bob King's eight [Hidden Gems in Common Deep-Sky Objects](#) now in evening view. One example is the planetary nebula inside the open cluster M46, east of Sirius.

## Friday, February 24

- Sirius blazes high in the south on the meridian by about 8 or 9 p.m. now. Using binoculars, examine the spot 4° south of Sirius (directly below it when on the meridian). Four degrees is somewhat less than the width of a typical binocular's field of view. Can you see a dim little patch of speckly gray haze? That's the open star cluster M41, about 2,200 light-years away. Sirius, by comparison, is only 8.6 light-years away.

Source: [Sky & Telescope](#)

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# ISS Sighting Opportunities

[For Denver:](#)

**No sightings for Denver through Feb. 24<sup>th</sup>.**

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

## NASA-TV Highlights

(all times Eastern Daylight Time)

**TBD, Wednesday, February 22 - NASM'S "STEM in 30"** – Taking the Fast Lane to Orbit: The Technology of Rockets and Racecars (NTV-1 (Public))

**12:30 a.m., Wednesday, February 22** - Coverage of the Launch of the ISS Progress 66 Cargo Craft to the ISS (Launch scheduled at 12:58 a.m. ET) (all channels)

**4:30 a.m., Wednesday, February 22** - Rendezvous and Capture of the SpaceX CRS-10 Dragon Cargo Craft at the ISS (Grapple is scheduled at 6 a.m.) (all channels)

**8:30 a.m., Wednesday, February 22** - Coverage of the Installation of the SpaceX CRS-10 Dragon Craft on the ISS (all channels)

**1 p.m., Wednesday, February 22** - Spitzer Exoplanet Science Briefing (all channels)

**12:30 p.m., Thursday, February 23** - ISS Expedition 50 JSC Social Media Q and A with Flight Engineer Peggy Whitson of NASA (starts at 12:55 p.m.) (all channels)

**2:30 a.m., Friday, February 24** - Coverage of the Docking of the ISS Progress 66 Cargo Craft to the ISS (Docking scheduled at 3:34 a.m. ET) (starts at 2:45 a.m.) (all channels)

**10:30 a.m., Friday, February 24** - ISS Expedition 50 In-Flight Interview for ESA with the BBC and Flight Engineer Thomas Pesquet of the European Space Agency (all channels)

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

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# Space Calendar

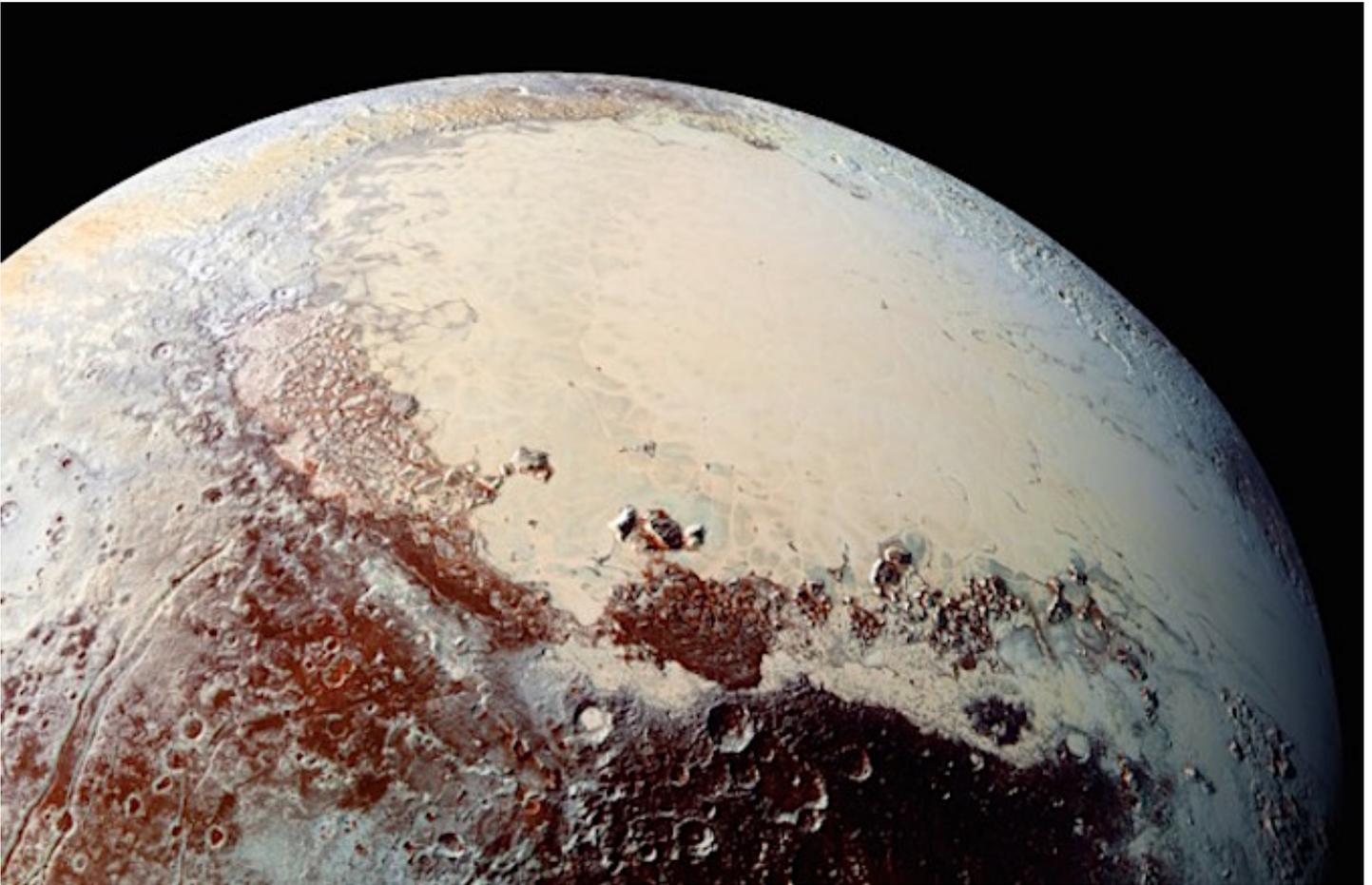
- Feb 21 - [Cassini](#), Distant Flyby of Pan, Prometheus, Pallene, Ephemetheus & Aegaeon
- Feb 21 - [Comet C/2015 X7 \(ATLAS\) At Opposition](#) (3.217 AU)
- Feb 21 - [Comet C/2015 X4 \(Elenin\) At Opposition](#) (4.241 AU)
- Feb 21 - [Asteroid 9 Metis At Opposition](#) (8.7 Magnitude)
- Feb 21 - [Asteroid 14413 Geiger](#) Closest Approach To Earth (1.401 AU)
- Feb 21 - [Asteroid 8657 Cedrus](#) Closest Approach To Earth (1.916 AU)
- Feb 21 - [Asteroid 13688 Oklahoma](#) Closest Approach To Earth (2.606 AU)
- Feb 21 - 10th Anniversary (2007) Mahadevpur Meteorite Fall (Hit House in India)
- Feb 21-24 - [10th Coastal Altimetry Workshop](#), Florence, Italy
- Feb 22 -  [Feb 16] [Progress MS-5 Soyuz-U Launch](#) (International Space Station 66P)
- Feb 22 - [Comet 321P/SOHO At Opposition](#) (2.887 AU)
- Feb 22 - [Comet P/2014 W4 \(PANSTARRS\) At Opposition](#) (3.763 AU)
- Feb 22 - [Apollo Asteroid 2016 CO246](#) Near-Earth Flyby (0.039 AU)
- Feb 22 -  [Feb 19] [Apollo Asteroid 2017 DE](#) Near-Earth Flyby (0.067 AU)
- Feb 22 - [Asteroid 8734 Warner](#) Closest Approach To Earth (1.965 AU)
- Feb 22 - [Asteroid 16035 Sasandford](#) Closest Approach To Earth (1.990 AU)
- Feb 22 - [Asteroid 13677 Alvin](#) Closest Approach To Earth 2.349 AU)
- Feb 22 - [Asteroid 2476 Andersen](#) Closest Approach To Earth (2.397 AU)
- Feb 22 - [Asteroid 234750 Amymainzer](#) Closest Approach To Earth (2.932 AU)
- Feb 22 - [Heinrich Hertz's 160th Birthday](#) (1857)
- Feb 23 - [Comet 73P-AX/Schwassmann-Wachmann Perihelion](#) (0.973 AU)
- Feb 23 - [Comet P/2010 H2 \(Vales\) At Opposition](#) (2.270 AU)
- Feb 23 - [Comet 50P/Arend At Opposition](#) (2.537 AU)
- Feb 23 - [Apollo Asteroid 2017 BY93](#) Near-Earth Flyby (0.006 AU)
- Feb 23 -  [Feb 19] [Apollo Asteroid 2017 DD](#) Near-Earth Flyby (0.037 AU)
- Feb 23 - [Asteroid 1718 Namibia](#) Closest Approach To Earth (2.039 AU)
- Feb 23 - 30th Anniversary (1987), [Supernova 1987A Explosion](#)
- Feb 23 - 265th Anniversary (1752), [Nicolas Louis de Lacaille's Discovery of M83 \(Southern Pinwheel Galaxy\)](#)
- Feb 24 - [Comet 73P-AV/Schwassmann-Wachmann Closest Approach To Earth](#) (1.404 AU)
- Feb 24 - [Comet C/2014 R3 \(PANSTARRS\) Closest Approach To Earth](#) (6.829 AU)
- Feb 24 - [Apollo Asteroid 2017 CP1](#) Near-Earth Flyby (0.009 AU)
- Feb 24 - [Aten Asteroid 5604 \(1992 FE\) Near-Earth Flyby](#) (0.034 AU)
- Feb 24 - [Amor Asteroid 2017 BN3](#) Near-Earth Flyby (0.065 AU)
- Feb 24 - [Asteroid 3808 Tempel](#) Closest Approach To Earth (0.979 AU)
- Feb 24 - [Asteroid 9941 Iguanodon](#) Closest Approach To Earth (1.078 AU)
- Feb 24 - [Asteroid 4134 Schutz](#) Closest Approach To Earth (1.187 AU)
- Feb 24 - [Asteroid 11365 NASA](#) Closest Approach To Earth (1.260 AU)
- Feb 24 - [Asteroid 6600 Qwerty](#) Closest Approach To Earth (1.488 AU)
- Feb 24 - [Asteroid 26733 Nanavistor](#) Closest Approach To Earth (1.997 AU)
- Feb 24 - [Asteroid 3623 Chaplin](#) Closest Approach To Earth (2.095 AU)
- Feb 24 - [Asteroid 17744 Jodiefoster](#) Closest Approach To Earth (2.143 AU)
- Feb 24 - [Asteroid 881 Athene](#) Closest Approach To Earth (2.164 AU)
- Feb 24 - [Asteroid 7749 Jackschmitt](#) Closest Approach To Earth (2.750 AU)
- Feb 24 - [Astronomy and Astrophysics Advisory Committee \(AAAC\) Teleconference](#)
- Feb 24 - [Brian Schmidt's 50th Birthday](#) (1967)

Source: [JPL Space Calendar](#)

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## Food for Thought

NASA Scientists Have Proposed a New Definition of Planets, and Pluto Could Soon Be Back



NASA scientists have published [a manifesto](#) that proposes a new definition of a planet, and if it holds, it will instantly add [more than 100](#) new planets to our Solar System, including Pluto and our very own Moon.

The key change the team is hoping to get approved is that cosmic bodies in our Solar System no longer need to be orbiting the Sun to be considered planets - they say we should be looking at their intrinsic physical properties, not their interactions with stars.

"In keeping with both sound scientific classification and peoples' intuition, we propose a geophysically-based definition of 'planet' that importantly emphasises a body's intrinsic physical properties over its extrinsic orbital properties," [the researchers explain](#).

The team is led by Alan Stern, principle investigator of NASA's New Horizons mission to Pluto, which in 2015 [achieved the first-ever fly-by](#) of the controversial dwarf planet.

Pluto was famously 'demoted' to dwarf planet status [back in August 2006](#), when astronomer Mike Brown from the California Institute of Technology (Caltech) proposed a rewrite of the definition of planets.

The [International Astronomical Union \(IAU\)](#), which controls such things, declared that the definition of a planet in our Solar System reads as follows:

"A celestial body that (a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and (c) has cleared the neighbourhood around its orbit."

Having not yet cleared the neighbourhood of its orbit in space, Pluto could no longer hold the designation of a planet under these new guidelines.

Stern, who obviously has a great fondness for Pluto, having led the mission that showed us all its [adorable heart pattern](#) for the first time, recently called the decision "[bullshit](#)".

"Why would you listen to an astronomer about a planet?" Stern, a planetary scientist, pointed out to Kelly Dickerson [at Business Insider in 2015](#).

He said asking an astronomer, who studies a wide variety of celestial objects and cosmic phenomena, rather than a planetary scientist, who focusses solely on planets, moons, and planetary systems, for the definition of a planet is like going to a podiatrist for brain surgery.

"Even though they're both doctors, they have different expertise," [Stern said](#). "You really should listen to planetary scientists that know something about this subject. When we look at an object like Pluto, we don't know what else to call it."

Now, Stern and his colleagues have rewritten the definition of a planet, and are submitting it to the IAU for consideration.

"We propose the following geophysical definition of a planet for use by educators, scientists, students, and the public," [they write](#).

"A planet is a sub-stellar mass body that has never undergone nuclear fusion and that has sufficient self-gravitation to assume a spheroidal shape adequately described by a triaxial ellipsoid regardless of its orbital parameters."

If that's a little too jargony for you, their 'layman's version' is simply: "Round objects in space that are smaller than stars."

The definition sounds incredibly simple, but it's deceptively narrow - there aren't a whole lot of objects in the known Universe that would qualify, as it excludes things like stars and stellar objects such as white dwarfs, plus neutron stars and black holes.

"In keeping with emphasising intrinsic properties, our geophysical definition is directly based on the physics of the world itself, rather than the physics of its interactions with external objects," [the researchers explain](#).

This would mean that our Moon, and other moons in the Solar System such as Titan, Enceladus, Europa, and Ganymede, would all qualify as planets, as would Pluto itself, which has already been looking [more and more 'planet-like'](#) of late.

The researchers don't just argue that their definition holds more merit than the current one in terms of what properties we should be using to classify a planet - they say the current definition is inherently flawed for several reasons.

- "First, it recognises as planets only those objects orbiting our Sun, not those orbiting other stars or orbiting freely in the galaxy as 'rogue planets'," [they explain](#).

- Second, the fact that it requires zone-clearing means "no planet in our Solar System" can satisfy the criteria, since a number of small cosmic bodies are constantly flying through planetary orbits - [including Earth's](#).
- Finally, and "most severely", [they say](#), this zone-clearing stipulation means the mathematics used to confirm if a cosmic body is actually a planet must be distance-dependent, because a "zone" must be clarified.

This would require progressively larger objects in each successive zone, and "even an Earth-sized object in the Kuiper Belt would not clear its zone".

Of course, nothing changes until the IAU makes a decision, and if it decides to rejig the definition of a planet, either by these recommendations or others in the future, it's going to take a whole lot of deliberating before it becomes official.

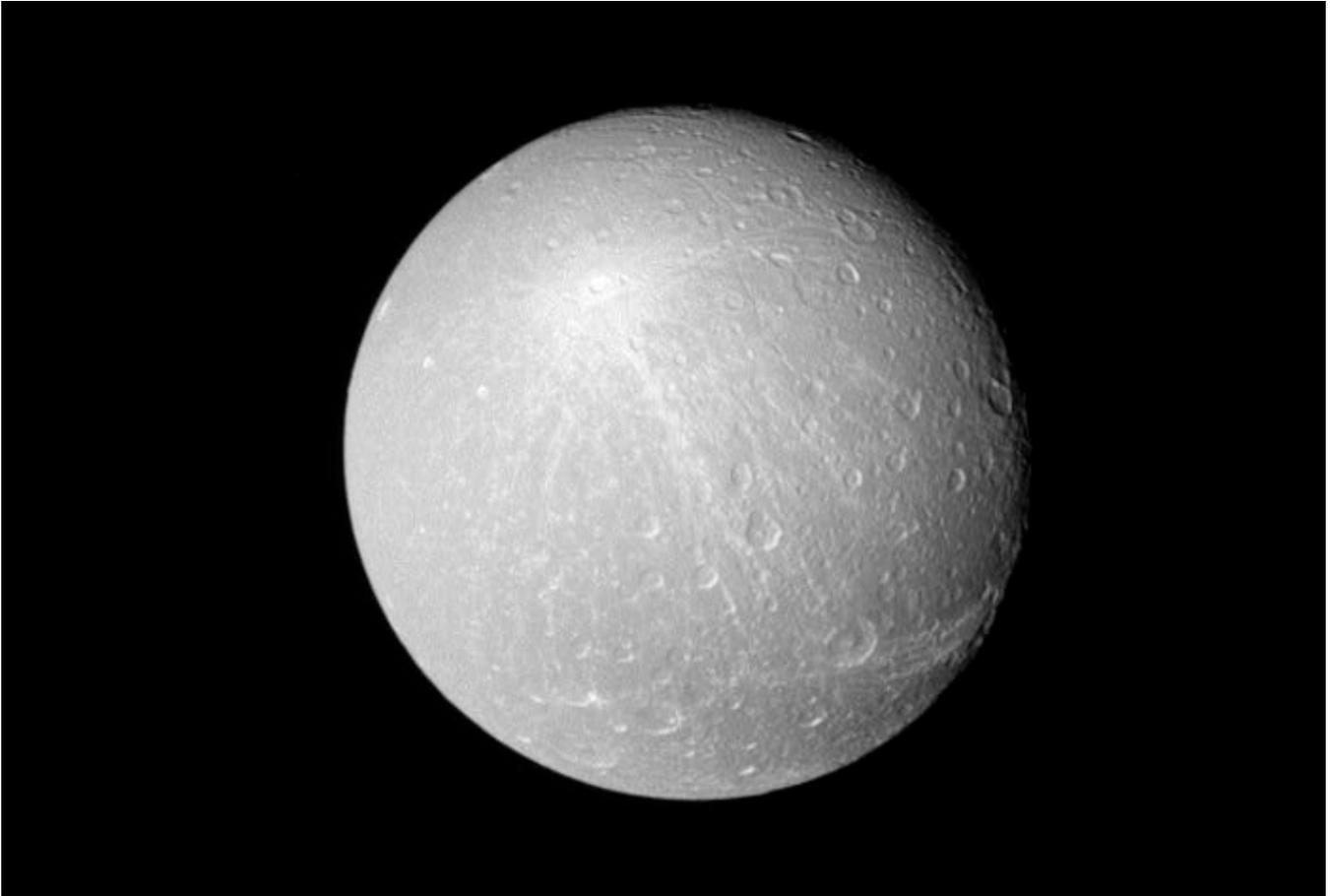
But the team claims to have the public on their side, and if [this public debate](#) is anything to go on, maybe it's time for a rethink - even if Stern just really wants to [stop having to answer](#) the question: "Why did you send New Horizons to Pluto if it's not a planet anymore?"

You can read the proposal in full [here](#).

Source: [Science Alert](#)

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## Space Image of the Week



### Rays of Creusa

When viewed from a distance with the sun directly behind Cassini, the larger, brighter craters really stand out on moons like Dione.

Among these larger craters, some leave bright ray patterns across the moon, calling attention to their existence and to the violence of their creation.

The rayed crater seen here on Dione (698 miles, or 1,123 kilometers across) is named Creusa. The rays are brighter material blasted out by the impact that formed the crater. Scientists can use the patterns of ejecta (like these rays), to help determine the order of geological events on a moon's surface by examining which features lie on top of other features.

This view looks toward the Saturn-facing side of Dione. North on Dione is up and rotated 31 degrees to the right. The image was taken with the Cassini spacecraft narrow-angle camera on Nov. 26, 2016 using a spectral filter which preferentially admits wavelengths of near-infrared light centered at 727 nanometers.

The view was obtained at a distance of approximately 350,000 miles (560,000 kilometers) from Dione. Image scale is 1.8 miles (3 kilometers) per pixel.

**Credit: NASA/JPL-Caltech/Space Science Institute**

Source: [NASA](#)

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