

# Space News Update – May 2018

*By Pat Williams*

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*Disclaimer - I claim no authorship for the printed material; except where noted (PW).*

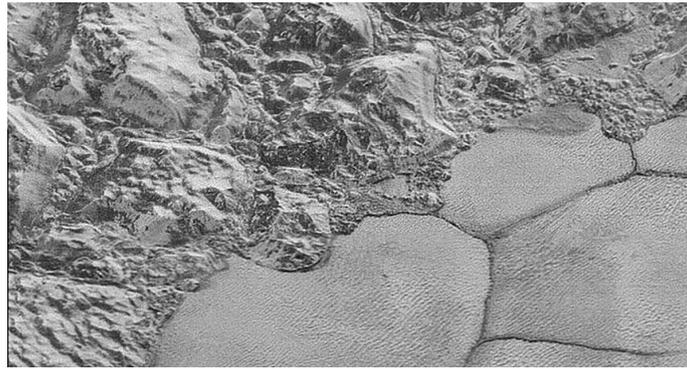
## **DRILLING SUCCESS: CURIOSITY IS COLLECTING MARS ROCKS**



*NASA's Curiosity rover successfully drilled a 2-inch-deep hole in a target called "Duluth" on May 20. It was the first rock sample captured by the drill since October 2016. This image was taken by Curiosity's Mast Camera (Mastcam) on Sol 2057. It has been white balanced and contrast-enhanced. Credits: NASA/JPL-Caltech/MSSS*

Engineers working with NASA's Curiosity Mars rover have been hard at work [testing a new way](#) for the rover to drill rocks and extract powder from them. This past weekend, that effort produced the first drilled sample on Mars in more than a year. Curiosity tested [percussive drilling](#), penetrating about 2 inches (50 millimeters) into a target called "[Duluth](#)." NASA's Jet Propulsion Laboratory in Pasadena, California, has been testing this drilling technique since a mechanical problem took Curiosity's drill offline in December of 2016. The technique, called Feed Extended Drilling, keeps the drill's bit extended out past two stabilizer posts that were originally used to steady the drill against Martian rocks. It lets Curiosity drill using the force of its robotic arm, a little more like the way a human would drill into a wall at home. (JPL) [Drilling success: Curiosity is collecting Mars rocks](#) (23 May 2018)

## **THE SECRETS BEHIND PLUTO'S DUNES**

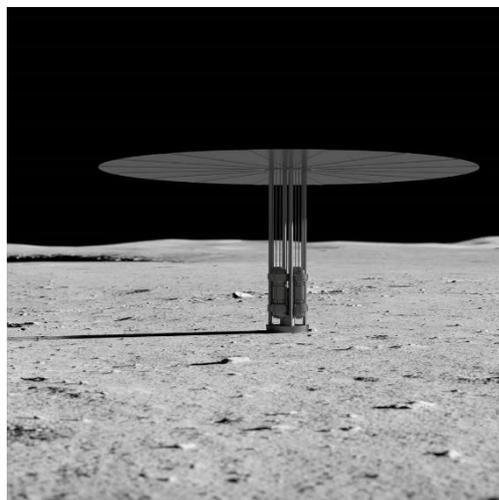


*BLOWING IN THE WIND. This image from the New Horizons spacecraft's 2015 flyby of Pluto shows dunes (centre bottom and right) along a mountain range. The ripples are made of sand-sized grains of methane ice, researchers say. Credit: SWRI, JHU Applied Physics Lab, NASA*

Scientists have discovered dunes on Pluto, and say they are likely to have been formed of methane ice grains released into its rarefied atmosphere. An international team of geographers, physicists and planetary scientists have analyzed detailed images of the dwarf planet's surface. Those images showed that there is a series of dunes spread across an area less than 75km across. Following spatial analysis of the dunes and nearby wind streaks on the planet's surface, as well as spectral and numerical modelling, scientists believe that sublimation (which converts solid nitrogen directly into a gas) results in sand-sized grains of methane being released into the environment. These are then transported by Pluto's moderate winds (which can reach between 30 and 40 kmh), with the border of the ice plain and mountain range providing the perfect location for such regular surface formations to appear. The scientists also believe the undisturbed morphology of the dunes and their relationship with the underlying glacial ice suggests the features are likely to have been formed within the last 500,000 years, and possibly much more recently. (University of Plymouth)

[The secrets behind Pluto's dunes](#) (31 May 2018)

## **DEMONSTRATION PROVES NUCLEAR FISSION SYSTEM CAN PROVIDE SPACE EXPLORATION POWER**

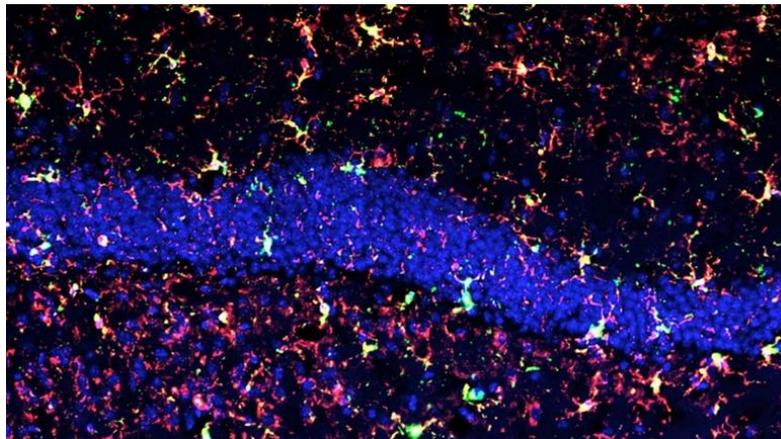


*Artist's concept of new fission power system on the lunar surface. Credits: NASA*

NASA and the Department of Energy's National Nuclear Security Administration (NNSA) have successfully demonstrated a new nuclear reactor power system that could enable long-duration crewed missions to the Moon, Mars and destinations beyond. NASA announced the results of the demonstration, called the Kilopower Reactor. Kilopower is a small, lightweight fission power system capable of providing up to 10 kilowatts of electrical power - enough to run several average households - continuously for at least 10 years. Four Kilopower units would provide enough power to establish an outpost. (NASA)

[Demonstration proves nuclear fission system can provide space exploration power](#)  
(2 May 2018)

## **DEEP SPACE RADIATION TREATMENT REBOOTS BRAIN'S IMMUNE SYSTEM**



*Reactive microglia (red+green) in irradiated mouse hippocampus. Blue stain is cell nuclei for anatomical reference. Credit: Rosi lab / UCSF*

Researchers exposed mice for a day to a dose of radiation comparable to what they might experience in deep space. A week later some of the mice were treated for 15 days with PLX5622, a drug produced by Berkeley-based pharmaceutical company which had [previously been shown](#) to prevent cognitive deficits in a mouse model of cancer radiation therapy when administered prior to irradiation of the brain. In the present study, the irradiated animals initially displayed no cognitive deficits, but after three months they began showing signs of memory impairment. Normally, when researchers place mice in a room with a familiar and an unfamiliar object, the animals spend more time exploring the new object. But mice that had been exposed to space radiation three months earlier explored the two objects equally, presumably because they didn't remember having seen one of the objects just the day before. Remarkably, animals that had been treated with PLX5622 soon after being exposed to radiation performed just like healthy mice on the memory task. The researchers examined the animals' brains and showed that while the brains of untreated mice were full of activated microglia and had lost significant numbers of synapses, the brains of treated mice looked just like normal. The authors hypothesize that by forcing the brain to replace irritable, radiation-exposed microglia with new, healthy microglia, the drug had allowed the animals avoid the cognitive consequences of radiation. This is neat evidence, first that rebooting the brain's microglia can protect cognitive function following radiation exposure, and second that we don't necessarily need to treat immediately following the radiation exposure for the drug to be effective. (University of California San Francisco)

[Deep space radiation treatment reboots brain's immune system](#) (21 May 2018)

## NEXT RESUPPLY MISSION TO SPACE STATION

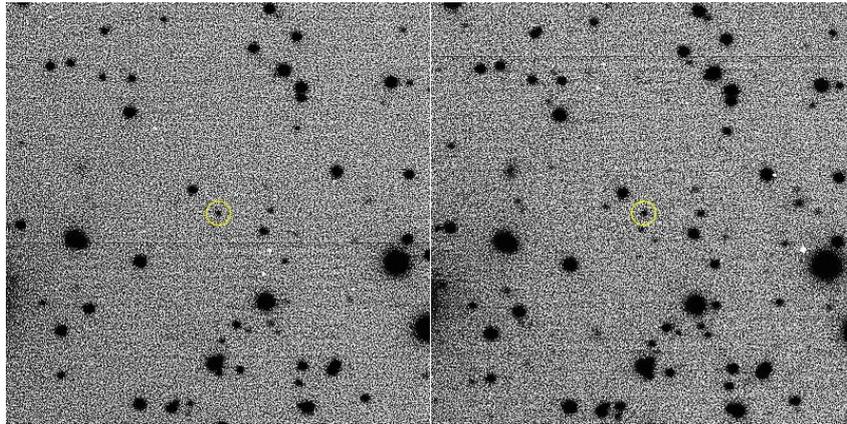


*The Orbital ATK Cygnus cargo craft is pictured as the International Space Station orbits above the state of Florida, The Bahamas and the country of Cuba. Credits: NASA*

Astronauts soon will have new experiments to conduct related to emergency navigation, DNA sequencing and ultra-cold atom research when the research arrives at the International Space Station following the launch of an [Orbital ATK](#) Cygnus spacecraft. Cygnus lifted off on an Antares 230 rocket from NASA's Wallops Flight Facility in Virginia on Orbital ATK's ninth cargo mission under NASA's Commercial Resupply Services contract. The spacecraft is carrying about 7,400 pounds of research equipment, cargo and supplies that will support dozens of the more than 250 investigations underway on the space station. NASA astronauts Scott Tingle and Ricky Arnold will use the space station's robotic arm to capture Cygnus when it arrives at the station Thursday, May 24. Included in the cargo in the pressurized area of Cygnus is a centuries-old method of celestial navigation. The [Sextant Navigation](#) investigation will explore the use of a hand-held sextant for emergency navigation on missions in deep space as humans look to travel farther from Earth. The ability to sight angles between the Moon or planets and stars offers crews another option to find their way home if communications and main computers are compromised. Monitoring crew health and the biological environment of the space station, and understanding long-term effects of space travel on both, are critical to NASA's plans for long-duration, deep space exploration. The Biomolecule Extraction and Sequencing Technology ([BEST](#)) study is the agency's next step toward advancing in-space DNA sequencing technologies that can identify microbial organisms living on the space station and understanding how the DNA of humans, plants and microbes are affected by microgravity. BEST will use a process that sequences DNA directly from a sample, with minimal preparation, rather than using the traditional technique of growing a culture from the sample. In the realm of modern physics, the new Cold Atom Lab ([CAL](#)) on Cygnus could help answer some big questions. CAL creates a temperature 10 billion times colder than the vacuum of space, then uses lasers and magnetic forces to slow down atoms until they are almost motionless. In the microgravity environment of the space station, CAL can observe these ultra-cold atoms for much longer than possible on Earth. Results of this research could lead to several improved technologies, including sensors, quantum computers and atomic clocks used in spacecraft navigation. Cygnus is scheduled to depart the station in July with several tons of trash and burn up during re-entry into Earth's atmosphere, over the Pacific Ocean. (NASA)

[Next resupply mission to space station](#) (14 May 2018)

## **FIRST INTERSTELLAR IMMIGRANT DISCOVERED IN THE SOLAR SYSTEM**



*Images of 2015 BZ509 obtained at the Large Binocular Telescope Observatory (LBTO) that established its retrograde co-orbital nature. The bright stars and the asteroid (circled in yellow) appear black and the sky white in this negative image.  
Credit: C. Veillet / Large Binocular Telescope Observatory.*

A new study has discovered the first known permanent immigrant to our Solar System. The asteroid, currently nestling in Jupiter's orbit, is the first known asteroid to have been captured from another star system. The object known as 'Oumuamua was the last interstellar interloper to hit the headlines in 2017. However, it was just a tourist passing through, whereas this former exo-asteroid, given the catchy name (514107) 2015 BZ509, is a long-term resident. All of the planets in our Solar System, and the vast majority of other objects as well, travel around the Sun in the same direction. However, 2015 BZ509 is different – it moves in the opposite direction in what is known as a 'retrograde' orbit. (Royal Astronomical Society) [First interstellar immigrant discovered in the Solar System](#)(21 May 2018)

## **LINKS TO OTHER SPACE NEWS PUBLISHED IN MAY 2018**

### **ASTEROIDS**

[Exiled Asteroid Discovered in Outer Reaches of Solar System](#) (9 May 2018)

An international team of astronomers has used ESO telescopes to investigate a relic of the primordial Solar System. The team found that the unusual Kuiper Belt Object 2004 EW95 is a carbon-rich asteroid, the first of its kind to be confirmed in the cold outer reaches of the Solar System. This curious object likely formed in the asteroid belt between Mars and Jupiter and has been flung billions of kilometres from its origin to its current home in the Kuiper Belt. (ESO)

### **BLACK HOLES**

[Black hole bounty captured in the Milky Way centre](#) (9 May 2018)

Astronomers have discovered evidence for thousands of black holes located near the center of our Milky Way galaxy using data from NASA's Chandra X-ray Observatory. This black hole bounty consists of stellar-mass black holes, which typically weigh between five to 30 times the mass of the Sun. These newly identified black holes were found within three light years, a

relatively short distance on cosmic scales, of the supermassive black hole at our Galaxy's center known as Sagittarius A\* (Sgr A\*). Theoretical studies of the dynamics of stars in galaxies have indicated that a large population of stellar mass black holes, as many as 20,000, could drift inward over the eons and collect around Sgr A\*. This recent analysis using Chandra data is the first observational evidence for such a black hole bounty. (NASA)

#### [Astronomers find fastest-growing black hole known in space](#) (15 May 2018)

The astronomers have looked back more than 12 billion years to the early dark ages of the Universe, when this supermassive black hole was estimated to be the size of about 20 billion suns with a one per cent growth rate for every one million years. This black hole is growing so rapidly that it's shining thousands of times more brightly than an entire galaxy, due to all the gases it sucks in daily that cause lots of friction and heat. The energy emitted from this newly discovered supermassive black hole, also known as a quasar, was mostly ultraviolet light but also radiated x-rays. The SkyMapper telescope at the ANU Siding Spring Observatory detected this light in the near-infrared, as the light waves had red-shifted over the billions of light years to Earth. As the Universe expands, space expands and that stretches the light waves and changes their colour. These large and rapidly-growing blackholes are exceedingly rare. The European Space Agency's Gaia satellite, which measures tiny motions of celestial objects, helped find this supermassive black hole. The object that they had found was sitting still, meaning that it was far away, and it was a candidate to be a very large quasar. The discovery of the new supermassive black hole was confirmed using the spectrograph on the ANU 2.3 metre telescope to split colours into spectral lines. The hunt is on to find even faster-growing black holes. As these kinds of black holes shine, they can be used as beacons to see and study the formation of elements in the early galaxies of the Universe. Scientists can see the shadows of objects in front of the supermassive black hole. Fast-growing supermassive black holes also help to clear the fog around them by ionizing gases, which makes the Universe more transparent. Instruments on very large ground-based telescopes being built over the next decade would be able to directly measure the expansion of the Universe using these very bright black holes. (Australian National University)

#### [New model explains what we see when a massive black hole devours a star](#)(29 May 2018)

A star that wanders too close to the supermassive black hole in the center of its galaxy will be torn apart by the black hole's gravity in a violent cataclysm called a tidal disruption event (TDE), producing a bright flare of radiation. A new study led by theoretical astrophysicists at the University of Copenhagen's Niels Bohr Institute and UC Santa Cruz provides a unified model that explains recent observations of these extreme events. (UC Santa Cruz)

## COMETS

#### [Rosetta unravels formation of sunrise jets](#) (23 May 2018)

The atmosphere of Rosetta's comet 67P/Churyumov-Gerasimenko is far from homogeneous. In addition to sudden outbursts of gas and dust, daily recurring phenomena at sunrise can be observed. In these, evaporating gas and entrained dust are concentrated to form jet-like structures. A new study, led by the Max Planck Institute for Solar System Research (MPS) in Germany and published in the journal Nature Astronomy, now identifies the rugged, duck-shaped structure of the comet as the main cause of these jets. Not only do concave regions

collimate gas and dust emissions similar to an optical lens, the complex topography also provides some areas of the surface with more sunlight than others.  
(Max Planck Institute for Solar System Research)

## **DARK MATTER**

### [Construction begins on one of the world's most sensitive dark matter experiments](#)

(7 May 2018)

The future SuperCDMS SNOLAB experiment will hunt for weakly interacting massive particles (WIMPs), hypothetical components of dark matter. If a WIMP (white trace) strikes an atom inside the experiment's detector crystals (gray), it will cause the crystal lattice to vibrate (blue). The collision will also send electrons (red) through the crystal that enhance the vibrations. (FermiLab)

## **DWARF PLANETS**

### [Dawn mission: new orbit, new opportunities](#) (31 May 2018)

NASA's Dawn spacecraft is maneuvering to its lowest-ever orbit for a close-up examination of the inner solar system's only dwarf planet. In early June, Dawn will reach its new, final orbit above Ceres. Soon after, it will begin collecting images and other science data from an unprecedented vantage point. This orbit will be less than 30 miles (50 kilometers) above the surface of Ceres, 10 times closer than the spacecraft has ever been. Dawn will collect gamma ray and neutron spectra, which help scientists understand variations in the chemical makeup of Ceres' uppermost layer. That very low orbit also will garner some of Dawn's closest images yet. (JPL)

## **EARTH**

### [Study shows how Earth slows the solar wind to a gentle breeze](#) (31 May 2018)

As Earth orbits the sun at supersonic speed, it cuts a path through the solar wind. This fast stream of charged particles, or plasma, launched from the sun's outer layers would bombard Earth's atmosphere if not for the protection of Earth's magnetic field. Just as a motorboat creates a bow-shaped wave ahead of itself as the hull pushes through the water, Earth creates a similar effect, called a bow shock, as it pushes through the solar wind. Scientists have sought to explain how Earth's magnetic field can shove aside the powerful solar wind without unleashing calamity. They have known part of the answer for a long time: the bow shock converts energy from the solar wind to heat stored in electrons and ions. But now, researchers have important new clues about how this process occurs. A University of Maryland-led study describes the first observations of the process of electron heating in Earth's bow shock. The researchers found that when the electrons in the solar wind encounter the bow shock, they momentarily accelerate to such a high speed that the electron stream becomes unstable and breaks down. This breakdown process robs the electrons of their high speed and converts the energy to heat. (College of Computer, Mathematical, and Natural Sciences)

## EXOPLANETS

### [Hubble detects helium in the atmosphere of an exoplanet for the first time](#) (2 May 2018)

Astronomers using the NASA/ESA Hubble Space Telescope have detected helium in the atmosphere of the exoplanet WASP-107b. This is the first time this element has been detected in the atmosphere of a planet outside the Solar System. The discovery demonstrates the ability to use infrared spectra to study exoplanet extended atmospheres. The international team of astronomers, led by Jessica Spake, a PhD student at the **University of Exeter** in the UK, used Hubble's [Wide Field Camera 3](#) to discover helium in the atmosphere of the exoplanet WASP-107b. This is the first detection of its kind.

(Space Telescope Science Institute)

### [Astronomers find an exoplanet atmosphere free of clouds](#) (7 May 2018)

An international team of astronomers, led by Dr Nikolay Nikolov from the University of Exeter, have found that the atmosphere of the 'hot Saturn' WASP-96b is cloud-free. Using Europe's 8.2m Very Large Telescope in Chile, the team studied the atmosphere of WASP-96b when the planet passed in front of its host-star. This enabled the team to measure the decrease of starlight caused by the planet and its atmosphere, and thereby determine the planet's atmospheric composition. Just like an individual's fingerprints are unique, atoms and molecules have a unique spectral characteristic that can be used to detect their presence in celestial objects. The spectrum of WASP-96b shows the complete fingerprint of sodium, which can only be observed for an atmosphere free of clouds. (University of Exeter)

### [NASA's new planet hunter snaps initial test image, swings by Moon toward final orbit](#)

(17 May 2018)

NASA's next planet hunter, the Transiting Exoplanet Survey Satellite (TESS), is one step closer to searching for new worlds after successfully completing a lunar flyby on May 17. The spacecraft passed about 5,000 miles from the Moon, which provided a gravity assist that helped TESS sail toward its final working orbit. As part of camera commissioning, the science team snapped a two-second test exposure using one of the four TESS cameras. The image, centered on the southern constellation Centaurus, reveals more than 200,000 stars. TESS is expected to cover more than 400 times the area imaged with its four cameras during its initial two-year search for exoplanets (NASA Goddard)

## GALAXIES

### [Astronomers release most complete ultraviolet-light survey of nearby galaxies](#) (17 May 2018)

Much of the light in the universe comes from stars, and yet, star formation is still a vexing question in astronomy. To piece together a more complete picture of star birth, astronomers have used the Hubble Space Telescope to look at star formation among galaxies in our own cosmic back yard. The survey of 50 galaxies in the local universe, called the Legacy ExtraGalactic UV Survey (LEGUS), is the sharpest, most comprehensive ultraviolet-light look at nearby star-forming galaxies. (Space Telescope Science Institute)

### [Case Western Reserve astronomers find vast ionized hydrogen cloud in 'Whirlpool Galaxy' using ultra-sensitive Arizona telescope](#) (16 May 2018)

Astronomers have been keenly peering into M51, or the Whirlpool Galaxy, since the 1800s,

its signature spiral structure informing the earliest debates over the nature of galaxies and the Cosmos at large. The Case Western Reserve University astronomers first observed, using a refurbished 75-year-old telescope in the mountains of southwest Arizona, a massive cloud of ionized hydrogen gas spewing from a nearby galaxy and then essentially “cooked” by radiation from the galaxy’s central black hole. The discovery of the giant gas cloud potentially provides astronomers around the world with an unexpected “front row seat” to view the behaviour of a black hole and associated galaxy as it consumes and “recycles” hydrogen gas. This gives astronomers a great opportunity to study up close how gas is ejected from galaxies and how black holes can influence large regions of space around those galaxies. (Case Western Reserve University)

#### [Lightening up dark galaxies](#) (23 May 2018)

Despite substantial progress over the past half a century in understanding of how galaxies form, important open questions remain regarding how precisely the diffuse gas known as the ‘intergalactic medium’ is converted into stars. One possibility, suggested in recent theoretical models, is that the early phase of galaxy formation involves an epoch when galaxies contain a great amount of gas but are still inefficient at forming stars. Direct proof of such a ‘Dark Phase’ has been so far elusive, however. After all, dark galaxies do not emit much visible light. The observational discovery of such galaxies would therefore fill an important gap in our understanding of galaxy evolution. To overcome the obstacle that their target objects are dark, the team used a flashlight of sorts, which came in the form of quasars. These emit intense ultraviolet light, which in turn induces fluorescent emission in hydrogen atoms known as the Lyman-alpha line. As a result, the signal from any dark galaxies near the quasar gets a boost, making them visible. Such ‘fluorescent illumination’ has been used before in searches for dark galaxies, but Marino *et al.* now looked at the neighbourhood of quasars at greater distances than has been possible in earlier observations. Also, they acquired the full spectral information for each of the dark-galaxy candidates. Deep observations, 10 hours for each of the six quasar fields they studied, enabled Marino and her colleagues to efficiently tell dark-galaxy candidates apart from other sources. From initially 200 Lyman-alpha emitters, half a dozen regions remained that are unlikely to be normal star-forming stellar populations, making them robust candidates for dark galaxies. The advances in observational capability have become possible thanks to the Multi Unit Spectroscopic Explorer (MUSE) instrument at the Very Large Telescope (VLT) of the European Southern Observatory (ESO) in Chile. Previous studies were limited to imaging a relative narrow band of frequencies, for which specific filters had to be designed. The MUSE instrument instead allowed hunting ‘blindly’, without filters, for dark galaxies around quasars at larger distances from Earth than had been possible so far. (Eidgenössische Technische Hochschule Zürich)

## **GRAVITATIONAL WAVES**

#### [Gravitational wave event likely signalled creation of a black hole](#)(31 May 2018)

The spectacular merger of two neutron stars that generated gravitational waves announced last fall likely did something else: birthed a black hole. This newly spawned black hole would be the lowest mass black hole ever found. (NASA)

## **INTERNATIONAL SPACE STATION**

### [Orbital ATK successfully launches ninth cargo delivery mission to the International Space Station for NASA](#) (21 May 2018)

Orbital ATK, a global leader in aerospace and defense technologies, successfully launched the company's Antares rocket carrying its Cygnus™ spacecraft. The launch marks Orbital ATK's ninth cargo mission for NASA. The Antares medium-class rocket matched its record for the heaviest cargo load carried to date with approximately 7,400 pounds (3,350 kilograms) of vital supplies and scientific equipment aboard Cygnus that will be delivered to the crew aboard the International Space Station. Following an approximate nine-minute ascent, the "S.S. J.R. Thompson" Cygnus spacecraft, named in honor of J.R. Thompson, a distinguished leader in the space industry, was successfully deployed into orbit. (Orbital ATK)

### [NanoRacks launches 15 CubeSats, new commercial customers, on latest space station cargo resupply launch](#) (24 May 2018)

Cygnus, the spacecraft from the ninth contracted resupply mission for Orbital ATK, berthed with the International Space Station carrying another satellite-filled NanoRacks mission. (NanoRacks)

### [Orbital ATK's Cygnus spacecraft successfully completes rendezvous and berthing with International Space Station](#) (24 May 2018)

Cargo is delivered to the station using Orbital ATK's Cygnus spacecraft. The Cygnus spacecraft consists of two modules: The Service Module (SM) which incorporates the avionics, propulsion and power systems from Orbital ATK's flight proven LEOStar and GEOStar spacecraft buses; and the Pressurized Cargo Module (PCM) which carries the crew supplies, spares and scientific experiments. (Orbital ATK)

## **MARS**

### [Hammering down to Martian depths – countdown to NASA's InSight mission](#) (3 May 2018)

The formation of planets and the occurrence of volcanism and earthquakes are determined by the thermally driven forces acting inside a planet. Continents and life as we know it emerged on Earth. On Mars, the internal development dynamics slowed rapidly. To decipher the interior of Mars and its past in more detail, and to find out what makes Earth so unique, an Atlas launch vehicle will lift off from Vandenberg Air Force Base in California at 13:05 CEST (04:05 local time) on 5 May, carrying NASA's Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) lander to Mars. Upon its arrival on 26 November 2018, InSight will touch down just north of the equator, on the Elysium Planitia plain, where it will commence its work as a geophysical observatory. (DLR)

### [NASA, ULA launch mission to study how Mars was made](#) (5 May 2018)

NASA's Mars Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) mission is on a 300-million-mile trip to Mars to study for the first time what lies deep beneath the surface of the Red Planet. (NASA)

[Lockheed Martin-built NASA InSight lander officially on its way to Mars](#) (5 May 2018)

Landers have explored the surface of Mars in unique ways, but InSight, managed by NASA's Jet Propulsion Laboratory, will be the first mission to peer beneath the surface and take the vital signs of the planet. It will be the first mission to study the planet's interior by measuring its heat output and observing its rotational variations. It will use the seismic waves generated by Mars quakes and meteorite impacts to develop a map of the planet's deep interior. The resulting insight into Mars' formation will help mission scientists to better understand how other rocky planets, including Earth, evolved. (Lockheed Martin)

[NASA's first deep-space CubeSats say: 'Polo!'](#) (5 May 2018)

NASA has received radio signals indicating that the first-ever CubeSats headed to deep space are alive and well. Engineers will now be performing a series of checks before both CubeSats enter their cruise to deep space. Mars Cube One is a pair of briefcase-sized spacecraft that launched along with NASA's [InSight](#) Mars lander. InSight is a scientific mission that will probe the Red Planet's deep interior for the first time; the name stands for Interior Exploration using Seismic Investigations, Geodesy and Heat Transport. The twin MarCO CubeSats are on their own separate mission: rather than collecting science, they will follow the InSight lander on its cruise to Mars, testing out miniature spacecraft technology along the way. Both were programmed to unfold their solar panels soon after launch, followed by several opportunities to radio back their health. Both MarCO-A and B say 'Polo!' It's a sign that the little sats are alive and well. The computers inside each MarCO CubeSat haven't been turned on since being tested in mid-March. Each spacecraft had to do a lot of things right by itself for the team to hear a signal: batteries had to retain enough charge for the spacecraft to deploy their solar arrays, stabilize their attitude, turn toward the Sun and turn on their radios. A couple of weeks will be spent assessing how the MarCO CubeSats are performing. If they survive the radiation of space and function as planned, they'll fly over the Red Planet during InSight's entry, descent and landing in November. They each have a special antenna to relay InSight's vital signs during the infamous "[Seven Minutes of Terror](#)," the crucial phase which has claimed the majority of humanity's probes sent to land on the Red Planet. (JPL)

[Mars helicopter to fly on NASA's next Red Planet rover mission](#) (11 May 2018)

NASA is sending a helicopter to Mars. The Mars Helicopter, a small, autonomous rotorcraft, will travel with the agency's [Mars 2020](#) rover mission, currently scheduled to launch in July 2020, to demonstrate the viability and potential of heavier-than-air vehicles on the Red Planet. The Mars Helicopter is a technology demonstration. It will attempt controlled flight in Mars' thin atmosphere, which may enable more ambitious missions in the future. (NASA)

[Belgium and LaRa on their way to Mars](#) (14 May 2018)

LaRa will be the first Belgian instrument to be landed on the surface of Mars. Its radio transmitter and receiver will link Mars and Earth, enabling scientists at the Royal Observatory to study the rotation of Mars as well as its internal structure, with focus on its core. LaRa will be part of the platform of ExoMars 2020, a joint mission by the ESA and Roscosmos, Russia's state space corporation. (OHB)

[NASA's Curiosity rover aims to get its rhythm back](#) (17 May 2018)

Engineers have been working for the past year to restore the rover's full drilling capabilities,

which were hampered in 2016 due to a mechanical problem. They will add percussion to a new technique already in use on Mars. This new technique is called Feed Extended Drilling, or FED. It lets Curiosity drill more like the way a person would at home, using the force of its robotic arm to push its drill bit forward as it spins. The new version of FED adds a hammering force to the drill bit. (JPL)

#### [Red Planet rover set for extreme environment workout](#) (29 May 2018)

A representative model of the ExoMars rover that will land on Mars in 2021 is beginning a demanding test campaign that will ensure it can survive the rigours of launch and landing, as well as operations under the environmental conditions of Mars. ExoMars is a joint endeavour between ESA and Roscosmos, with the Trace Gas Orbiter already at Mars and [beginning its science mission](#) to look for atmospheric gases that may be linked to active geological or biological processes. The orbiter will relay the data collected by the rover back to Earth, a capability already demonstrated with communications relays to NASA's rovers currently on Mars. The ExoMars rover will be the first of its kind to drill below the surface, down to 2 m, and determine if evidence of life is buried underground, protected from the destructive radiation that impinges the surface today. (ESA)

## SATELLITES

#### [Bangabandhu Satellite 1 successfully launched](#) (12 May 2018)

It is a very historical and exciting moment for the entire nation of Bangladesh to watch its very first satellite taking off for Space successfully. This telecommunications and Broadcasting satellite is targeted to narrow the digital divide, as it will take broadcasting and telecommunication services to rural areas and introduce profitable services, including direct-to-home services, across the country and over the region. (Thales Alenia Space)

## STARS AND STAR CLUSTERS

#### [NASA's NICER mission finds an X-ray pulsar in a record-fast orbit](#) (10 May 2018)

Scientists analyzing the first data from the [Neutron star Interior Composition Explorer \(NICER\)](#) mission have found two stars that revolve around each other every 38 minutes. One of the stars in the system, called IGR J17062–6143 (J17062 for short), is a rapidly spinning, superdense star called a pulsar. The discovery bestows the stellar pair with the record for the shortest-known orbital period for a certain class of pulsar binary system. The data from NICER also show J17062's stars are only about 186,000 miles (300,000 kilometers) apart, less than the distance between Earth and the Moon. Based on the pair's breakneck orbital period and separation, scientists involved in a new study of the system think the second star is a hydrogen-poor white dwarf. (NASA Goddard)

#### [ALMA and VLT find evidence for stars forming just 250 million years after Big Bang](#) (16 May 2018)

Astronomers have used observations from the Atacama Large Millimeter/submillimeter Array (ALMA) and ESO's Very Large Telescope (VLT) to determine that star formation in the very distant galaxy MACS1149-JD1 started at an unexpectedly early stage, only 250

million years after the Big Bang. This discovery also represents the most distant oxygen ever detected in the Universe and the most distant galaxy ever observed by ALMA or the VLT. (ESO)

## SUN

[New insights into solar flares' explosive energy releases](#) (24 May 2018)

EOVSA, which is funded by the National Science Foundation, is the first radio imaging instrument that can make spectral images fast enough, in one second, to follow the rapid changes that occur in solar flares. This capability allows the radio spectrum to be measured dynamically throughout the flaring region, to pinpoint the location of particle acceleration and map where those particles travel. Images of solar flares at most other wavelengths show only the consequences of heating by the accelerated particles, whereas radio emission can directly show the particles themselves. (New Jersey Institute of Technology)

## TECHNOLOGY

[Wi-Fi in space and spacecraft technologies launched on Blue Origin Rocket](#) (1 May 2018)

A company vying to be the first internet service provider in space as well as a NASA monitoring system for testing technologies on suborbital vehicles were both carried into space when [Blue Origin](#)'s New Shepard rocket successfully launched on April 29. (NASA Armstrong)

[X-ray navigation considered for possible CubeSat mission; NASA studies technique for human exploration](#) (3 May 2018)

Now that NASA has shown the viability of autonomous X-ray navigation in space, a team plans to include the technology on a proposed CubeSat mission to the Moon, and NASA engineers are now studying the possibility of adding the capability to future human-exploration spacecraft. Interest in this emerging capability to guide spacecraft to the far reaches of the solar system comes just months after NASA [successfully demonstrated the technique](#) — commonly known as XNAV — with an experiment called Station Explorer for X-ray Timing and Navigation Technology, or SEXTANT. (NASA Goddard)

[Small packages to test big space technology advances](#) (17 May 2018)

When the next cargo resupply mission to the International Space Station lifts off from NASA Wallops Flight Facility in Virginia, it will be carrying among its supplies and experiments three cereal box-sized satellites that will be used to test and demonstrate the next generation of Earth-observing technology. NASA has been increasing its use of CubeSats, small satellites based on several configurations of approximately 4 x 4 x 4-inch cubes, to put new technologies in orbit where they can be tested in the harsh environment of space before being used as part of larger satellite missions or constellations of spacecraft. (JPL)

[SpaceDataHighway: 10,000 successful laser connections - reliability of 99.8 per cent](#) (18 May 2018)

The SpaceDataHighway system, the world's first 'optical fibre in the sky' based on cutting-

edge laser technology, has achieved 10,000 successful laser connections. The reliability rate has reached 99.8 percent, and during the first one and a half years of routine operations these successful connections have downloaded more than 500 terabytes of data. The system's satellites are designed to lock on to low-orbiting satellites via laser and collect their data as they travel in low Earth orbit scanning the Earth. From its position in geostationary orbit, the SpaceDataHighway acts as a relay, transmitting the large quantities of data acquired by these observation satellites down to Earth in near-real time at a speed of 1.8 Gbit/s, instead of storing the data on board until the satellites pass over their own ground station.  
(Airbus Munich)

## **TELESCOPES**

[Greenland Telescope opens new era of arctic astronomy](#) (1 May 2018)

Some anticipated discoveries for the Greenland Telescope include:

- Participating in imaging the event horizon of a black hole, the point of no return for infalling matter. This feat has never been accomplished.
- Testing Einstein's theory of General Relativity in environments where extreme gravity exists.
- Probing the physics around black holes with unprecedented detail.

The Greenland Telescope project represents a creative way to conduct state-of-the-art science. The 12-meter radio antenna was originally built as a prototype for the Atacama Large Millimeter/Submillimeter Array (ALMA) project, currently in operations in Chile. By repurposing this telescope to Greenland, astronomers can take advantage of the near-ideal conditions of the Arctic to study the Universe at specific radio frequencies.  
(Harvard-Smithsonian Center for Astrophysics)

*Pat Williams May 2018*