

# Space News Update – March 2018

*By Pat Williams*

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

## TWO NASA ASTRONAUTS AMONG CREW HEADING TO INTERNATIONAL SPACE STATION

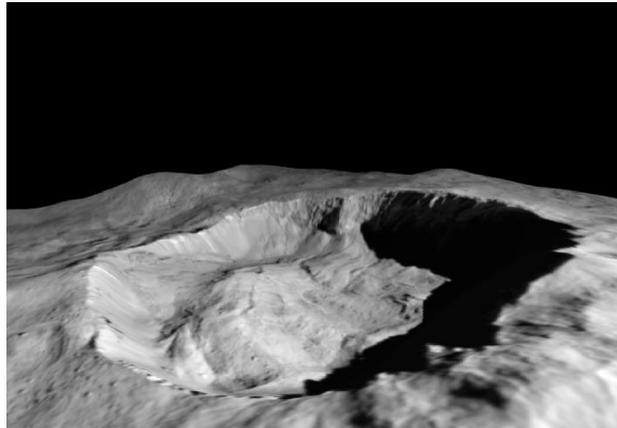


*The Soyuz MS-08 spacecraft carrying NASA astronauts Drew Feustel and Ricky Arnold, and Oleg Artemyev of the Russian space agency Roscosmos, lifts off from the Baikonur Cosmodrome in Kazakhstan. Credits: NASA/Joel Kowsky*

Three crew members, including NASA astronauts [Drew Feustel](#) and [Ricky Arnold](#), are on their way to the [International Space Station](#). The arrival of Feustel, Arnold and Oleg Artemyev of the Russian space agency Roscosmos will restore the station's crew complement to six. They will join [Scott Tingle](#) of NASA, [Expedition 55](#) Commander Anton Shkaplerov of Roscosmos and Norishige Kanai of the Japan Aerospace Exploration Agency. The crew members will spend more than five months conducting about 250 science investigations in fields such as biology, Earth science, human research, physical sciences and technology development. (NASA Johnson)

[Two NASA astronauts among crew heading to International Space Station](#) (21 March 2018)

## **DAWN REVEALS RECENT CHANGES IN CERES' SURFACE**



*This view from NASA's Dawn mission shows where ice has been detected in the northern wall of Ceres' Juling Crater, which is in almost permanent shadow. Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA/ASI/INAF*

Observations of Ceres have detected recent variations in its surface, revealing that the only dwarf planet in the inner solar system is a dynamic body that continues to evolve and change. NASA's Dawn mission has found recently exposed deposits that give us new information on the materials in the crust and how they are changing. Changes in the abundance of water ice on a short timescale, as well as the presence of hydrated sodium carbonates, are further evidence that Ceres is a geologically and chemically active body (JPL)

[Dawn reveals recent changes in Ceres' surface](#) (14 March 2018)

## **HUMAN-MACHINE INTERACTION IN SPACE - FIRST TECHNOLOGY EXPERIMENT USING ARTIFICIAL INTELLIGENCE ON THE ISS**



*Credit: DLR/T*

The Crew Interactive MOBILE companion (CIMON) can see, hear, understand, speak and fly. It is roughly spherical, has a diameter of 32 centimetres and weighs five kilograms. From summer 2018, CIMON will become the new 'crew member' on the International Space Station (ISS), to demonstrate cooperation between humans and intelligent machines in the form of a technology experiment. CIMON's structure was built entirely using a 3D printing process and is made of metal and plastic. Its 'face' is a display unit intended to hover at the astronaut's eye level. It can present and explain information and instructions for scientific experiments and repairs. Its 'eyes' are two cameras, and it also has an additional camera for face recognition. Two side cameras are used for video documentation and could also be used

for additional computer-generated functions (augmented reality). Ultrasonic sensors measure distances for collision detection. Seven microphones act as 'ears' for detecting where sounds are originating, and there is a directional microphone for good voice recognition. Its 'mouth' is a loudspeaker that can be used to talk or play music. The core speech comprehension element of the AI is the IBM Watson system. CIMON is unable to learn independently; a human must actively train it. The AI for autonomous navigation is provided by Airbus and used for motion planning and object recognition. CIMON can freely move and rotate in all spatial directions using 14 internal fans. It can therefore turn towards the astronaut when it is spoken to, nod and shake its head and follow the astronaut – autonomously or on command. In microgravity on the ISS, it can be used for two hours. The dimensions of CIMON's face are modelled on the proportions of a human face. Gestures and facial expressions are also possible, as is a female, male or neutral appearance and voice. CIMON's product design was implemented in collaboration with Reichert Design, a company from Stetten am Bodensee. (DLR)

[Human-machine interaction in space - first technology experiment using artificial intelligence on the ISS](#) (2 March 2018)

## **PLASTICS, POLLUTION & PIRATES: SATELLITE VU PREPARES TO TACKLE HUMANITY'S GLOBAL CHALLENGES**



*Plastic Pollution. Credit: Satellite Vu*

Pioneering NewSpace company, Satellite Vu, is preparing to provide a disruptive service to those who tackle critical global issues. Earth observation has become a key part of environmental monitoring, delivering a wealth of information using combinations of sensor data and high-resolution imagery. Satellite Vu is poised to transform this market through the launch of unique and ground-breaking satellites that will deliver infrared imaging and hourly re-visit times, both day and night. In the last decade, we have produced more plastic than in the entire 20th century and plastic constitutes approximately 90% of all waste floating on the ocean surface. According to UNESCO, excessive nutrients from sewage outfalls and agricultural runoff have contributed to the number of low oxygen (hypoxic) areas known as dead zones, where most marine life cannot survive, resulting in the collapse of some ecosystems. Piracy, arms smuggling, people-trafficking and illegal fishing are conducted by clandestine ships that are currently hard to detect and identify. In 2017, there were 180 incidents of piracy at sea, putting thousands of seafarers at risk, and there are numerous occurrences of arms and people smuggling. Other issues related to population, natural resources and conflict are all matters of global concern, yet these occur prevalently in areas that are currently barely monitored by space-based systems. (Satellite Vu)

[Plastics, pollution & pirates: Satellite Vu prepares to tackle humanity's global challenges](#) (12 March 2018)

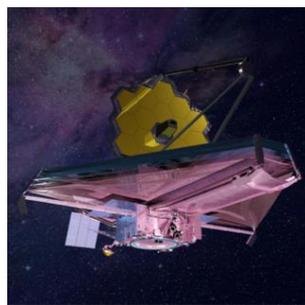
## **PLANT GROWTH CHAMBER DEVELOPED FOR NASA BY TUPPERWARE AND TECHSHOT LAUNCHING ON SPACEX CRS-14**



An improved system for growing plants in space, developed for NASA by Tupperware Brands and Techshot Inc., is expected to launch to the International Space Station (ISS) April 2 aboard a commercial SpaceX Dragon cargo capsule from Florida's Cape Canaveral Air Force Station. Since 2014, astronauts aboard the ISS have been growing a variety of leafy vegetables and colourful flowers inside the Vegetable Production System, otherwise known as the 'Veggie' facility. NASA is always seeking to improve upon existing technologies, while reducing its need for resources, such as crew time. To reduce the frequency that an astronaut must water plants growing in space, Dr. Howard Levine and his colleagues at the NASA Kennedy Space Center (KSC) began exploring new design concepts for the component of Veggie that holds the root structure of the plants, the so-called 'plant pillows'. Research at KSC led to a semi-hydroponic design concept dubbed the Passive Orbital Nutrient Delivery System (PONDS). (Techshot)

[Plant growth chamber developed for NASA by Tupperware and Techshot launching on SpaceX CRS-14](#) (27 March 2018)

## **NASA'S WEBB OBSERVATORY REQUIRES MORE TIME FOR TESTING AND EVALUATION; NEW LAUNCH WINDOW UNDER REVIEW**



*Illustration of NASA's James Webb Space Telescope. Credits: NASA*

NASA's James Webb Space Telescope currently is undergoing final integration and test phases that will require more time to ensure a successful mission. After an independent assessment of remaining tasks for the highly complex space observatory, Webb's previously revised 2019 launch window now is targeted for approximately May 2020. (NASA)

[NASA's Webb observatory requires more time for testing and evaluation; new launch window under review](#) (27 March 2018)

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

### **ASTEROIDS**

[Russian physicists make toy asteroids and blast them with a laser](#) (13 March 2018)

A large team of Russian researchers, joined by three [MIPT](#) physicists, has modeled the impact of a nuclear explosion on an Earth-threatening asteroid. They manufactured miniature asteroids and blasted them with a laser. (MIPT)

### **ASTROPHYSICS**

[Massive astrophysical objects governed by subatomic equation](#) (5 March 2018)

Fundamentally, the Schrödinger Equation governs the evolution of wave-like disturbances. In a sense, the waves that represent the warps and lopsidedness of astrophysical disks are not too different from the waves on a vibrating string, which are themselves not too different from the motion of a quantum particle in a box. In retrospect, it seems like an obvious connection, but it's exciting to begin to uncover the mathematical backbone behind this reciprocity. (Caltech)

### **BLACK HOLES**

[Scientists detect radio echoes of a black hole feeding on a star](#) (18 March 2018)

On Nov. 11, 2014, a global network of telescopes picked up signals from 300 million light years away that were created by a tidal disruption flare, an explosion of electromagnetic energy that occurs when a black hole rips apart a passing star. Since this discovery, astronomers have trained other telescopes on this very rare event to learn more about how black holes devour matter and regulate the growth of galaxies. Scientists have now detected radio signals from the event that match very closely with X-ray emissions produced from the same flare 13 days earlier. They believe these radio “echoes,” which are more than 90 percent like the event’s X-ray emissions, are more than a passing coincidence. Instead, they appear to be evidence of a giant jet of highly energetic particles streaming out from the black hole as stellar material is falling in. (MIT)

### **DARK MATTER**

[Unprecedentedly wide and sharp dark matter map](#) (1 March 2018)

A research team of multiple institutes, including the National Astronomical Observatory of Japan and University of Tokyo, released an unprecedentedly wide and sharp dark matter map based on the newly obtained imaging data by Hyper Suprime-Cam on the Subaru Telescope. The dark matter distribution is estimated by the weak gravitational lensing technique. The team located the positions and lensing signals of the dark matter halos and found indications that the number of halos could be inconsistent with what the simplest cosmological model suggests. This could be a new clue to understanding why the expansion of the Universe is accelerating. (Subaru Telescope, NAOJ)

### [Dark matter is a no show in ghostly galaxy](#) (28 March 2018)

Galaxies and dark matter go hand in hand; you typically don't find one without the other. So, when researchers uncovered a galaxy, known as NGC1052-DF2, that is almost completely devoid of the stuff, they were shocked. Finding a galaxy without dark matter is unexpected because this invisible, mysterious substance is the most dominant aspect of any galaxy. For decades, we thought that galaxies start their lives as blobs of dark matter. After that everything else happens: gas falls into the dark matter halos, the gas turns into stars, they slowly build up, then you end up with galaxies like the Milky Way. NGC1052-DF2 challenges the standard ideas of how we think galaxies form. (Keck Observatory)

## **EARTH**

### [Sounding rocket mission will trace auroral winds](#) (1 March 2018)

Understanding the contribution that aurora make to the total amount of energy that enters and leaves Earth's geospace system, referred to as auroral forcing, is one of the major goals of the NASA-funded Auroral Zone Upwelling Rocket Experiment, or AZURE. The more we learn about auroras, the more we understand about the fundamental processes that drive near-Earth space, a region that is increasingly part of the human domain, home not only to astronauts but also communications and GPS signals that can affect those of us on the ground daily.

AZURE is the first of eight sounding rocket missions launching over the next two years as part of an international collaboration of scientists known as The Grand Challenge Initiative – Cusp. These missions will launch from the Andøya and Svalbard rocket ranges in Norway to study the processes occurring inside the Earth's polar cusp, where the planet's magnetic field lines bend down into the atmosphere and allow particles from space to intermingle with those of Earthly origin and nearby auroral oval, which AZURE will focus on. (NASA Goddard)

### [United Launch Alliance successfully launches GOES-S weather satellite for NASA and NOAA](#) (1 March 2018)

GOES-S will be operated from a vantage point 22,300 miles above Earth to cover the western United States, Alaska and Hawaii, providing unprecedented advancements in the clarity and timeliness of observations over the region. It will work in tandem with the GOES-R satellite that was successfully launched by an Atlas V rocket on Nov. 19, 2016. These satellites have played a vital role in weather forecasting, storm tracking and meteorological research. The next-generation GOES-R series scans the Earth five times faster at four times the image resolution, with triple the number of data channels than previous GOES satellites for more reliable forecasts. (ULA)

## **EXOPLANETS**

### [Large amount of water in an exoplanet's atmosphere](#) (1 March 2018)

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

[The cosmic cocktail of exoplanet atmospheres](#) (8 March 2018)

With haze clouding up a telescope's ability to tell scientists which gases make up an exoplanet's atmosphere, our ability to detect life elsewhere is a murkier prospect. Scientists have conducted the first lab experiments on haze formation in simulated exoplanet atmospheres, an important step for understanding upcoming observations of planets outside the solar system with the [James Webb Space Telescope](#). The simulations are necessary to establish models of the atmospheres of far-distant worlds, models that can be used to look for signs of life outside the solar system. (Johns Hopkins University)

[15 new planets confirmed around cool dwarf stars](#) (12 March 2018)

Scientists report the existence of 15 new planets including one 'super-Earth' that could harbour liquid water orbiting small, cool stars near our solar system. These stars, known as [red dwarfs](#)<sup>1</sup>, are of enormous interest for studies of planetary formation and evolution. (Tokyo Institute of Technology)

[ESA's next science mission to focus on nature of exoplanets](#) (20 March 2018)

The nature of planets orbiting stars in other systems will be the focus for ESA's fourth medium-class science mission, to be launched in 2028. Ariel, the Atmospheric Remote-sensing Infrared Exoplanet Large-survey mission, was selected by ESA as part of its Cosmic Vision plan. The mission addresses one of the key themes of Cosmic Vision: What are the conditions for planet formation and the emergence of life? (ESA)

[TRAPPIST-1 planets provide clues to the nature of habitable worlds](#) (20 March 2018)

M-dwarf stars, like TRAPPIST-1, are the most common stars in the universe (and while it's likely that there are planets orbiting these stars), the huge amount of water they are likely to have makes them unfavourable for life to exist, especially enough life to create a detectable signal in the atmosphere that can be observed. (Arizona State University)

[NASA prepares to launch next mission to search sky for new worlds](#) (28 March 2018)

NASA's Transiting Exoplanet Survey Satellite ([TESS](#)) is undergoing final preparations in Florida for its April 16 launch to find undiscovered worlds around nearby stars, providing targets where future studies will assess their capacity to harbor life. (NASA)

## **GALAXIES**

[Astronomers rethink quasar environment](#) (12 March 2018)

Using Hyper Suprime-Cam (HSC) mounted on the Subaru Telescope, astronomers have identified nearly 200 "protoclusters," the progenitors of galaxy clusters, in the early Universe, about 12 billion years ago, about ten times more than previously known. They also found that quasars don't tend to reside in protoclusters; but if there is one quasar in a protocluster, there is likely a second nearby. This result raises doubts about the relation between protoclusters and quasars. (Subaru Telescope NAOJ)

[Astronomers discover galaxies spin like clockwork](#) (14 March 2018)

Astronomers have discovered that all galaxies rotate once every billion years, no matter how big they are. (ICRAR)

[Hubble solves cosmic 'whodunit' with interstellar forensics](#) (22 March 2018)

The players are two dwarf galaxies, the Large Magellanic Cloud and the Small Magellanic Cloud, both of which orbit our own Milky Way Galaxy. But as they go around the Milky Way, they are also orbiting each other. Each one tugs at the other, and one of them has pulled out a huge cloud of gas from its companion. Did the gas come from the Large Magellanic Cloud or the Small Magellanic Cloud? After much analysis, the team finally had conclusive chemical “fingerprints” to match the origin of the Leading Arm’s gas. The gas matches the Small Magellanic Cloud which indicates the Large Magellanic Cloud is winning the tug-of-war, because it has pulled so much gas out of its smaller neighbor. (Space Telescope Science Institute)

## **INTERNATIONAL SPACE STATION**

[Material samples to be tested on the International Space Station](#) (6 March 2018)

NASA has selected five technologies for its Materials International Space Station Experiment (MISSE)-11 mission to test them aboard the International Space Station (ISS); targeting a launch in spring 2019. MISSE missions enable long-term exposure of materials, such as composites and polymeric specimens, to the inhospitable space environment. The space environment is very harsh, and materials, especially polymeric materials, can erode. There are a lot of different environmental complications happening at the same time, atomic oxygen, charged particle radiation, ultraviolet radiation, temperature extremes, vacuum conditions, micrometeoroids and orbital debris etc. (NASA Goddard)

[Predicting the lifespan of materials in space](#) (19 March 2018)

Almost every product we use has a shelf life. It is vital for scientists to know exactly how long a material will last in outer space. Scientists are gathering data from the Materials International Space Station Experiment (MISSE) missions. In April, they will send 138 different material samples to the [International Space Station](#) as part of MISSE-9, which will be launched on SpaceX CRS-14 aboard a Dragon spacecraft. These samples will be part of the first MISSE mission to use the space station’s new external materials testing platform, the MISSE-Flight Facility ([MISSE-FF](#)). (NASA)

## **INTERSTELLAR OBJECT**

[New study shows what interstellar visitor ‘Oumuamua can teach us](#) (27 March 2018)

Scientists suspect most ejected planetesimals come from systems with giant gas planets. The gravitational pull of these massive planets can fling objects out of their system and into interstellar space. Systems with giant planets in unstable orbits are the most efficient at ejecting these smaller bodies because as the giants shift around, they meet more material. Systems that do not form giant planets rarely eject material. (NASA Goddard)

## **JUPITER AND MOONS**

[Jupiter's jet-streams are unearthly](#) (7 March 2018)

Data collected by NASA’s Juno mission to Jupiter indicate that the atmospheric winds of the

gas-giant planet run deep into its atmosphere and last longer than similar atmospheric processes found here on Earth. The findings will improve understanding of Jupiter's interior structure, core mass and, eventually, its origin. Other Juno science results released today include that the massive cyclones that surround Jupiter's north and south poles are enduring atmospheric features and unlike anything else encountered in our solar system (JPL)

[Jupiter's Great Red Spot getting taller as it shrinks](#) (13 March 2018)

Though once big enough to swallow three Earths with room to spare, Jupiter's Great Red Spot has been shrinking for a century and a half. Nobody is sure how long the storm will continue to contract or whether it will disappear altogether. A new study suggests that it hasn't all been downhill, though. The storm seems to have increased in area at least once along the way, and it's growing taller as it gets smaller. (NASA Goddard)

## **MARS**

[Next Mission to Mars gears up: Lockheed Martin delivers NASA's InSight spacecraft to launch site](#) (1 March 2018)

NASA's latest mission to Mars took its first trip on its long journey to the Red Planet. Lockheed Martin delivered NASA's InSight Mars lander to Vandenberg Air Force Base. The lander will now undergo final processing in preparation for a May 5 launch aboard a United Launch Alliance Atlas V 401 rocket. The InSight lander will study the deep interior of Mars and will address one of the most fundamental questions of planetary and solar system science: how do terrestrial planets form? By mapping the basic structure of the planet, the mission will help scientists understand the processes that shaped the rocky planets of the inner solar system more than four billion years ago. (Lockheed Martin)

[First test success for largest Mars mission parachute](#) (29 March 2018)

The largest parachute ever to fly on a Mars mission has been deployed in the first of a series of tests to prepare for the upcoming ExoMars mission that will deliver a rover and a surface science platform to the Red Planet. The spacecraft that will carry them is due for launch in July 2020, with arrival at Mars in March 2021. The rover will be the first of its kind to drill below the surface and determine if evidence of life is buried underground, protected from the destructive radiation that impinges the surface today. (ESA)

## **STARS AND STAR CLUSTERS**

[Einstein@Home discovers first millisecond pulsar visible only in gamma rays](#)

(28 February 2018)

Einstein@Home has found two previously unknown rapidly rotating neutron stars in data from the Fermi gamma-ray space telescope. While all other such millisecond pulsars have also been observed with radio telescopes, one of the two discoveries is the first millisecond pulsar detectable solely through its pulsed gamma-ray emission. The findings raise hopes of detecting other new millisecond pulsars, e.g., from a predicted large population of such objects towards the centre of our Galaxy. (Albert Einstein Institute Hannover)

### [A better way to model stellar explosions](#) (1 March 2018)

Caltech scientists create new computer code for calculating neutron stars' "equation of state". Neutron stars consist of the densest form of matter known: a neutron star the size of Los Angeles can weigh twice as much as our sun. One tool scientists use to model these powerful phenomena is the "equation of state." Loosely, the equation of state describes how matter behaves under different densities and temperatures. The temperatures and densities that occur during these extreme events can vary greatly, and strange behaviors can emerge; for example, protons and neutrons can arrange themselves into complex shapes known as nuclear "pasta". There were about 20 equations of state readily available for simulations of astrophysical phenomena. Caltech postdoctoral scholar decided to tackle this problem using computer codes. Over the past three years, he has been developing open-source software that allows astrophysicists to generate their own equations of state. (Caltech)

### [Donor star breathes life into zombie companion](#) (5 March 2018)

ESA's Integral space observatory has witnessed a rare event: the moment that winds emitted by a swollen red giant star revived its slow-spinning companion, the core of a dead star, bringing it back to life in a flash of X-rays. (ESA)

### [Hubble finds huge system of dusty material enveloping the young star HR 4796A](#)

(6 March 2018)

Astronomers have used NASA's Hubble Space Telescope to uncover a vast, complex dust structure, about 150 billion miles across, enveloping the young star HR 4796A. A bright, narrow, inner ring of dust is already known to encircle the star and may have been corralled by the gravitational pull of an unseen giant planet. This newly discovered huge structure around the system may have implications for what this yet-unseen planetary system looks like around the 8-million-year-old star, which is in its formative years of planet construction. (Space Telescope Science Institute)

## **SUN**

### [NASA powers on new instrument staring at the sun](#) (15 March 2018)

NASA has powered on its latest space payload to continue long-term measurements of the Sun's incoming energy. Total and Spectral Solar Irradiance Sensor (TSIS-1), installed on the International Space Station, became fully operational with all instruments collecting science data as of this March. TSIS-1 extends a long data record that helps us understand the Sun's influence on Earth's radiation budget, ozone layer, atmospheric circulation, and ecosystems, and the effects that solar variability has on the Earth system and climate change (NASA Goddard)

## **SUPERNOVA**

### [Can strongly lensed Type Ia supernovae resolve one of cosmology's biggest controversies?](#)

(1 March 2018)

Last year an international team of researchers found a more reliable distance marker – the first-ever strongly lensed Type Ia supernova. These events occur when the gravitational field

of a massive object, like a galaxy, bends and refocuses passing light from a Type Ia event behind it. This “gravitational lensing” causes the supernova’s light to appear brighter and sometimes in multiple locations, if the light rays travel different paths around the massive object. Because different routes around the massive object are longer than others, light from different images of the same Type Ia event will arrive at different times. By tracking time-delay between the strongly lensed images, astrophysicists believe they can get a very precise measurement of the cosmic expansion rate. (Berkeley Lab)

[Kepler solves mystery of fast and furious explosions](#) (26 March 2018)

The universe is full of mysterious exploding phenomena that go boom in the dark. One type of ephemeral event, called a Fast-Evolving Luminous Transient (FELT), has bewildered astronomers for a decade because of its very brief duration. Now, NASA’s Kepler Space Telescope, designed to go hunting for planets across our galaxy, has also been used to catch FELTs in the act and determine their nature. They appear to be a new kind of supernova that gets a brief turbo boost in brightness from its surroundings. (STScI)

## TECHNOLOGY

[MATISSE instrument sees first light on ESO’s Very Large Telescope Interferometer](#)

(5 March 2018)

The new MATISSE instrument on ESO’s Very Large Telescope Interferometer (VLTI) has now successfully made its first observations at the Paranal Observatory in northern Chile. MATISSE is the most powerful interferometric instrument in the world at mid-infrared wavelengths. It will use high-resolution imaging and spectroscopy to probe the regions around young stars where planets are forming as well as the regions around supermassive black holes in the centres of galaxies. The first MATISSE observations used the VLTI’s Auxiliary Telescopes to examine some of the brightest stars in the night sky, including Sirius, Rigel and Betelgeuse, and showed that the instrument is working well. (ESO)

[World-first firing of air-breathing electric thruster](#) (5 March 2018)

In a world-first, an ESA-led team has built and fired an electric thruster to ingest scarce air molecules from the top of the atmosphere for propellant, opening the way to satellites flying in very low orbits for years on end. (ESA)

[BridgeSat opens world’s first NOC for laser satellite communications](#) (5 March 2018)

BridgeSat announced today the opening of its network operations center (NOC), the world’s first for free-space optical communications. The opening is an industry milestone toward revolutionizing global communications with a laser-based ground network for low earth orbit (LEO) and geostationary earth orbit (GEO) satellites that’s faster and less expensive than traditional radio frequency (RF) solutions. (BridgeSat)

[NASA team outfits Orion for abort test with lean approach](#) (5 March 2018)

The Orion crew module to be used in the [Ascent Abort-2](#) test at Johnson Space Center in Houston, where the team is already at work with a lean, iterative development approach to minimize cost and ensure the flight test stays on schedule. Engineers and technicians at NASA’s Langley Research Center in Hampton, Virginia modified a previously built Orion

test vehicle for the flight. Development hardware from the Pad Abort-1 test is being reused and components such as radio frequency transmitters have been repurposed to support characterization and integrated tests. Shuttle heritage hardware, such as pyrotechnic control cards that otherwise were not being used, are being integrated into flight designs which allows the team to avoid building or building everything new. Flight and ground software architectures have been evolved from other development projects. (NASA)

[NASA's James Webb observatory prepares for additional testing](#) (12 March 2018)

Engineers removed the combined optics and science instruments of NASA's James Webb Space Telescope from their shipping container in a high bay at Northrop Grumman Aerospace Systems in Redondo Beach, California, on March 8, signaling the next step in the observatory's integration and testing. (NASA Goddard)

[Astrobotic awarded NASA contract to develop CubeRover for lunar missions](#)

(13 March 2018)

Astrobotic, in partnership with Carnegie Mellon University, has been selected by NASA for a Phase II SBIR Award to develop CubeRover, a class of 2-kg rover platform capable of small-scale science and exploration on the Moon and other planetary surfaces. This new small rover platform complements Astrobotic's lunar payload delivery service by providing a low-cost mobility capability to the lunar surface for customers around the world. (Astrobotic)

[NASA, ATLAS to mature portable space communications technology](#) (14 March 2018)

Portable ground antenna stations could transform NASA's space communications capabilities. With access to undeveloped regions, the mobile systems could bolster the return of spacecraft science, instrument health and other data to Earth. ATLAS LINKS systems are mobile structures with four antenna units each less than 10 pounds that constantly survey the sky for spacecraft signals. They can be set up and taken down within minutes and only require access to internet and power. (NASA Goddard)

[Kepler spacecraft nearing the end as fuel runs low](#) (14 March 2018)

Trailing Earth's orbit at 94 million miles away, the Kepler space telescope has survived many potential knock-outs during its nine years in flight, from mechanical failures to being blasted by cosmic rays. At this rate, the hardy spacecraft may reach its finish line in a manner we will consider a wonderful success. With nary a gas station to be found in deep space, the spacecraft is going to run out of fuel. We expect to reach that moment within several months. (NASA Ames)

[Gaia status update](#) (21 March 2018)

Last month, ESA's Gaia satellite experienced a technical anomaly followed by a 'safe mode' event. After thorough examination, the spacecraft was successfully recovered and resumed normal scientific operations, while the mission team keeps investigating the exact cause of the anomaly. (ESA)

*Pat Williams March 2018*