

Space News Update – August 2019

By Pat Williams

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

IN-SPACE SELECTS ORBEX FOR SCOTTISH LAUNCH IN 2022



Credit: Orbex

The Faraday-2b satellite will be launched from what is expected to be continental Europe's first spaceport, Space Hub Sutherland, in the A'Mhoine peninsula in the Scottish Highlands. On August 1, 2019, Orbex's partner, Highlands and Islands Enterprise (HIE) confirmed that it had signed a 75-year lease option with landowners, the Melness Crofters Estate, to build and operate a spaceport on its land. This critical development opens the path for the UK and Europe's first sovereign vertical launch capability. (Orbex)

[In-Space selects Orbex for Scottish launch in 2022](#) (7 August 2019)

JAMES WEBB SPACE TELESCOPE SECONDARY MIRROR DEPLOYS FOR THE FIRST TIME USING THE SPACECRAFT FLIGHT ELECTRONICS

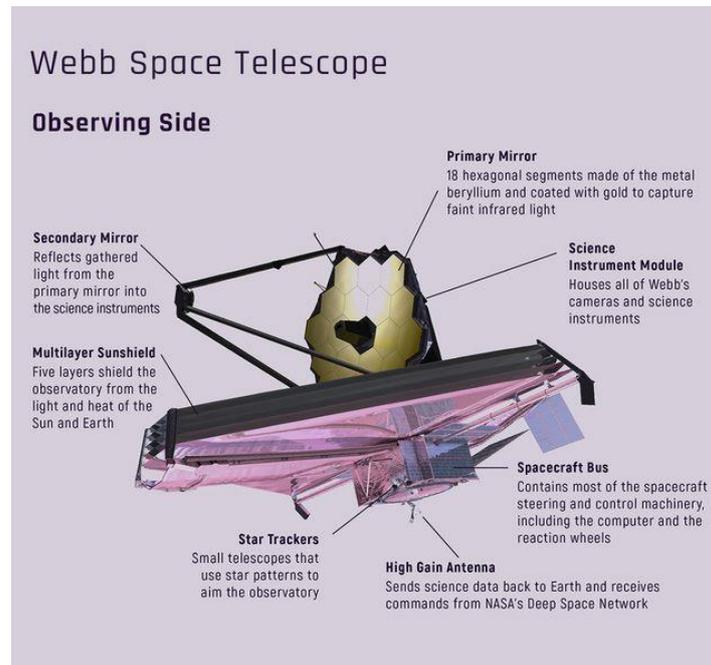


Image courtesy of NASA and C. Godfrey STScI

NASA's James Webb Space Telescope's Secondary Mirror Support Structure (SMSS) was deployed for the first time using the telescope's flight electronics at Northrop Grumman's clean room in Redondo Beach, California. The milestone marks another major interaction of the Observatory (Optical Telescope and Integrated Science Instrument [OTIS] module and the Spacecraft Element [SCE]), working together as they will in orbit. (Northrop Grumman) [James Webb Space Telescope secondary mirror deploys for the first time using the spacecraft flight electronics](#) (6 August 2019)

NORTHROP GRUMMAN FULLY ASSEMBLES NASA'S JAMES WEBB SPACE TELESCOPE



NASA's James Webb Space Telescope fully assembled at Northrop Grumman in Redondo Beach, Calif. Photo credit: NASA/Chris Gunn

NASA's James Webb Space Telescope Spacecraft Element (SCE) and Optical Telescope Element/Integrated Science Instrument Module (OTIS) are now one. Both halves of the

telescope (SCE and OTIS) have been successfully assembled. The James Webb Space Telescope will be the world's premier space science observatory when it launches in 2021. Webb will solve mysteries in our solar system, look beyond to distant worlds around other stars, and probe the mysterious structures and origins of our universe and our place in it.

(Northrop Grumman)

[Northrop Grumman fully assembles NASA's James Webb Space Telescope](#)

(28 August 2019)

NASA ENGINEERS ATTACH MARS HELICOPTER TO MARS 2020 ROVER



Handling Mars Helicopter: Members of the NASA Mars Helicopter team attach a thermal film to the exterior of the flight model of the Mars Helicopter. Image Credit: NASA/JPL-Caltech.

"Our job is to prove that autonomous, controlled flight can be executed in the extremely thin Martian atmosphere," said the Mars Helicopter project manager. "Since our helicopter is designed as a flight test of experimental technology, it carries no science instruments. But if we prove powered flight on Mars can work, we look forward to the day when helicopters can play an important role in future explorations of the Red Planet." Along with investigating difficult-to-reach destinations such as cliffs, caves and deep craters, they could carry small science instruments or act as scouts for human and robotic explorers. The agency intends to establish a sustained human presence on and around the Moon through NASA's Artemis lunar exploration plans, using the Moon as a stepping-stone to putting humans on Mars.

[NASA engineers attach Mars Helicopter to Mars 2020 rover](#) (29 August 2019)

US SPACE COMMAND ESTABLISHMENT CEREMONY LAUNCHES NEW ERA OF SPACE SUPERIORITY CAPABILITIES



Donald Trump launched US Space Command with one eye on creating a Space Force Credit: Reuters

In a move to enhance the United States' space superiority capabilities, President Donald J. Trump, Vice President Mike R. Pence, Secretary of Defense Dr. Mark T. Esper and Air Force Gen. John W. Raymond formally established the United States Space Command during a ceremony held Aug. 30 at the White House. At the direction of the President of the United States, the Department of Defense established U.S. Space Command as the 11th unified combatant command, with Raymond as its congressionally confirmed commander.

Establishing USSPACECOM is a critical step that underscores the importance of the space domain and its strategic contributions to U.S. national security. The USSPACECOM establishment will accelerate the United States' space capabilities to address rapidly evolving threats to U.S. space assets and the importance of deterring potential adversaries from putting critical U.S. space systems at risk. (US Space Command)

[US Space Command establishment ceremony launches new era of space superiority capabilities](#) (29 August 2019)

LINKS TO OTHER SPACE & ASTRONOMY NEWS PUBLISHED IN AUGUST 2019

ASTEROIDS

[NASA mission selects final four site candidates for asteroid sample return](#) (12 August 2019)

After months grappling with the rugged reality of asteroid Bennu's surface, the team leading NASA's first asteroid sample return mission has selected four potential sites for the Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) spacecraft to "tag" its cosmic dance partner. Since its arrival in December 2018, the OSIRIS-REx spacecraft has mapped the entire asteroid to identify the safest and most accessible spots for the spacecraft to collect a sample. These four sites now will be studied in further detail in order to select the final two sites, a primary and backup, in December. (NASA)

[The near-Earth asteroid Ryugu – a fragile cosmic 'rubble pile'](#) (22 August 2019)

If Ryugu or another similar asteroid were ever to come dangerously close to Earth and an attempt had to be made to divert it, this would need to be done with great care. If it was impacted with great force, the entire asteroid, weighing approximately half-a-billion tonnes, would break up into numerous fragments. Then, many individual parts weighing several tonnes would impact Earth. The asteroid is very similar to carbonaceous meteorites found on Earth, which date back 4.5 billion years. With an average density of just 1.2 grams per cubic centimetre, Ryugu is only a little 'heavier' than water ice. But as the asteroid is made up of numerous pieces of rock of different sizes, this means that much of its volume must be traversed by cavities, which probably makes this diamond-shaped body extremely fragile. This is also indicated by the measurements conducted by the DLR MASCOT Radiometer (MARA) experiment, which were published recently. (DLR)

[For first time, astronomers catch asteroid in the act of changing colour](#) (29 August 2019)

Last December, scientists discovered an "active" asteroid within the asteroid belt, between the orbits of Mars and Jupiter. The space rock, designated by astronomers as 6478 Gault, appeared to be leaving two trails of dust in its wake, active behaviour that is associated with comets but rarely seen in asteroids. An MIT-led team then reported that it has caught the asteroid in the act of changing colour, in the near-infrared spectrum, from red to blue. It is the first time scientists have observed a colour-shifting asteroid, in real-time. They think that they have witnessed the asteroid losing its reddish dust to space, and are seeing the asteroid's underlying, fresh blue layers. They have also confirmed that the asteroid is rocky, proof that

the asteroid's tail, though seemingly comet-like, is caused by an entirely different mechanism, as comets are not rocky but more like loose snowballs of ice and dust. It probably means that some mechanism responsible for dust emission is different from comets, and different from most other active main-belt asteroids. (MIT)

ASTROPHYSICS

[Astrophysical shock phenomena reproduced in the laboratory](#) (6 August 2019)

Vast interstellar events where clouds of charged matter hurtle into each other and spew out high-energy particles have now been reproduced in the lab with high fidelity. The work, by MIT researchers and an international team of colleagues, should help resolve longstanding disputes over exactly what takes place in these gigantic shocks. Many of the largest-scale events, such as the expanding bubble of matter hurtling outward from a supernova, involve a phenomenon called collisionless shock. In these interactions, the clouds of gas or plasma are so rarefied that most of the particles involved actually miss each other, but they nevertheless interact electromagnetically or in other ways to produce visible shock waves and filaments. These high-energy events have so far been difficult to reproduce under laboratory conditions that mirror those in an astrophysical setting, leading to disagreements among physicists as to the mechanisms at work in these astrophysical phenomena. Now, the researchers have succeeded in reproducing critical conditions of these collisionless shocks in the laboratory, allowing for detailed study of the processes taking place within these giant cosmic smash-ups. (MIT)

EARTH

[Orbital Micro Systems achieves Earth Observation breakthroughs](#) (19 August 2019)

Edinburgh UK - Orbital Micro Systems (OMS), a leader in advanced instrumentation for small satellite missions and analysis-ready earth data intelligence platforms, announced that data received from its IOD-1 GEMS satellite, deployed from the International Space Station on July 3, 2019, has proven the commercial viability of the company's advanced earth observation platform. OMS's miniaturized passive microwave radiometer onboard the satellite outmatched the best available microwave and infrared views of weather structures on earth, showing excellent clarity and detail not previously possible. (Orbital Micro Systems)

[New Landsat infrared instrument ships from NASA](#) (23 August 2019)

From orbit aboard the Landsat 9 satellite, the Thermal Infrared Sensor 2, or TIRS-2, will measure the temperature of Earth's land surfaces, detecting everything from a smoldering wildfire, to the amount of irrigation used on crop fields, to wispy clouds that are all but invisible to other instruments. First, however, it had to survive tests that simulated the harsh environment of space. (NASA Goddard)

[Streaks in aurora found to map features in Earth's radiation environment](#) (27 August 2019)

A special kind of streaked aurora has been found to track disturbances in near-Earth space from the ground. Known as structured diffuse aurora, it was recently discovered, with the help of NASA spacecraft and instruments, that these faint lights in the night sky can map the edges of the Van Allen radiation belts, hazardous concentric bands of charged particles encircling Earth. When the Van Allen belts undulate in shape and size, which they do in response to incoming radiation from the Sun as well as changes from Earth below, they can envelop satellites in unexpected radiation. The new discovery will help better track the edges

of the belts and the more we know about how the belts are changing, the more we can mitigate such effects. (NASA Goddard)

EXOPLANETS

[Hubble uncovers a 'heavy metal' exoplanet shaped like a football](#) (1 August 2019)

How can a planet be "hotter than hot?" The answer is when heavy metals are detected escaping from the planet's atmosphere, instead of condensing into clouds. Observations by NASA's Hubble Space Telescope reveal magnesium and iron gas streaming from the strange world outside our solar system known as WASP-121b. The observations represent the first time that so-called "heavy metals, elements heavier than hydrogen and helium, have been spotted escaping from a hot Jupiter, a large, gaseous exoplanet very close to its star. Normally, hot Jupiter-sized planets are still cool enough inside to condense heavier elements such as magnesium and iron into clouds. But that's not the case with WASP-121b, which is orbiting so dangerously close to its star that its upper atmosphere reaches a blazing 4,600 degrees Fahrenheit. The temperature in WASP-121b's upper atmosphere is about 10 times greater than that of any known planetary atmosphere. The WASP-121 system resides about 900 light-years from Earth. (STScI)

[Rocky, Earth-sized exoplanet is missing an atmosphere](#) (19 August 2019)

Astronomers at MIT, Harvard University, and elsewhere have searched a rocky, Earth-sized exoplanet for signs of an atmosphere and found none. Atmospheres have previously been detected on planets much larger than our own, including several hot-Jupiters and sub-Neptunes, all of which are primarily made of ice and gas. But this is the first time scientists have been able to nail down whether an Earth-sized, terrestrial planet outside our solar system has an atmosphere. The planet in question, LHS 3844b, was discovered in 2018 by NASA's Transiting Exoplanet Survey Satellite, TESS, and was measured to be about 1.3 times larger than Earth. The planet zips around its star in just 11 hours, making it one of the fastest orbiting exoplanets known. The star itself is a small, cool M-dwarf that resides just 49 light-years from Earth. (MIT)

[Hints of a volcanically active exomoon](#) (29 August 2019)

Jupiter's moon Io is the most volcanically active body in our solar system. Today, there are indications that an active moon outside our solar system, an exo-Io, could be hidden at the exoplanet system WASP-49b. "It would be a dangerous volcanic world with a molten surface of lava, a lunar version of close-in Super Earths like 55 Cancri-e. Astronomers have not yet discovered a rocky moon beyond our solar system and it's on the basis of circumstantial evidence that the researchers in Bern conclude that the exo-Io exists: Sodium gas was detected at the WASP 49-b at an anomalously high-altitude. The neutral sodium gas is so far away from the planet that it is unlikely to be emitted solely by a planetary wind. Observations of Jupiter and Io in our solar system, by the international team, along with mass loss calculations show that an exo-Io could be a very plausible source of sodium at WASP 49-b. The enormous tidal forces in such a system are the key to everything. The energy released by the tides to the planet and its moon keeps the moon's orbit stable, simultaneously heating it up and making it volcanically active. In their work, the researchers were able to show that a small rocky moon can eject more sodium and potassium into space through this extreme volcanism than a large gas planet, especially at high altitudes. Sodium and potassium lines are quantum treasures to astronomers because they are extremely bright. The researchers compared their calculations with these observations and found five candidate systems where a hidden exomoon can survive against destructive thermal evaporation. For WASP 49-b the

observed data can be best explained by the existence of an exo-Io. However, there are other options. For example, the exoplanet could be surrounded by a ring of ionized gas, or non-thermal processes. The researchers are therefore relying on further observations with ground-based and space-based instruments. (PlanetS)

[Exoplanets can't hide their secrets from innovative new instrument](#) (29 August 2019)

In an unprecedented feat, an American research team discovered hidden secrets of an elusive exoplanet using a powerful new instrument at the 8-meter Gemini North telescope on Mauna Kea in Hawai'i. The findings not only classify a Jupiter-sized exoplanet in a close binary star system, but also conclusively demonstrate, for the first time, which star the planet orbits. The breakthrough occurred when NASA Ames Research Centre's team used a high-resolution imaging instrument of their design, named 'Alopeke (a contemporary Hawaiian word for Fox). The team observed exoplanet Kepler-13b as it passed in front of (transited) one of the stars in the Kepler-13AB binary star system some 2,000 light years distant. Prior to this attempt, the true nature of the exoplanet was a mystery. (Gemini Observatory)

EXTRA TERRESTRIAL LIFE

[Shining \(star\)light on the search for life](#) (2 August 2019)

In the hunt for life on other worlds, astronomers scour over planets that are light-years away. They need ways to identify life from afar but what counts as good evidence? Our own planet provides some inspiration. Microbes fill the air with methane; photosynthesizing plants expel oxygen. Perhaps these gases might be found wherever life has taken hold. But on worlds very different from our own, putative signs of life can be stirred up by non-biological processes. To know a true sign when you see it you must look beyond the planet itself, all the way to the gleaming star it orbits. To this end, the team designed the SISTINE mission. Flying on a sounding rocket for a 15-minute flight, it will observe far-off stars to help interpret signs of life on the planets that orbit them. The mission will launch from the White Sands Missile Range in New Mexico in the early morning hours of Aug. 5, 2019. (NASA Goddard)

FUTURE PLANNED MISSIONS

[EDEN ISS project presents results of a new greenhouse concept for future space missions](#) (23 August 2019)

A DLR researcher spent one year on the perpetual ice cultivating vegetables under artificial light and without soil to test cultivation processes under conditions that are hostile for plants and humans. The researchers were surprised that they managed with much less energy than expected and yielded such a large harvest, which clearly strengthened the well-being and mood of the overwintering team. But the workload required to maintain and support the system must be reduced significantly in order to save valuable time for astronauts in the future. The operation of the Antarctic greenhouse is currently ongoing and is open to research groups across the globe. From the results and experiences of the EDEN ISS project, a new greenhouse concept for the Moon and Mars has emerged – deployable, compact and suitable for launch using a Falcon 9 rocket. Future, long-term crewed space missions will require locally grown food. EDEN ISS has proven the feasibility of a space greenhouse in the Antarctic and thus demonstrated that this technology could also be used to produce food on the Moon and Mars. The space greenhouse concept now being presented is a valuable foundation on which we wish to develop further research work. Over a period of one year in the Antarctic, the greenhouse has clearly demonstrated that enough food can be generated in a small space to supplement the diet of a future six-person crew with about one third of

freshly grown produce. This is a sensible supplement to the staple foods that the spacecraft will have brought with it from Earth. Overall, they have produced 268 kilograms of food in an area of only 12.5 square metres over 9.5 months, including 67 kilograms of cucumbers, 117 kilograms of lettuce and 50 kilograms of tomatoes. The taste and smell of fresh vegetables have left a lasting impression on the overwintering crew and have clearly had a positive effect on the team's mood over the long period of isolation. This correlation is also being researched from a psychological perspective. (DLR)

GALAXIES

[Revealing the intimate lives of MASSIVE galaxies](#) (22 August 2019)

Every galaxy has a story, and every galaxy has been many others in the past. Generally the most massive galaxies have led the most interesting lives, often within teeming galactic metropolises where they are subject to frequent interactions with assorted neighbours. These interactions influence the structure and motions of the stars, gas, and dark matter that make up the galaxies. They also affect the growth of the supermassive black holes at the galaxies' centres. Although the detailed life stories of most galaxies will remain forever uncertain, the key thematic elements may be surmised in various ways. A particularly powerful probe of a galaxy's dynamical structure is called integral field spectroscopy (IFS), which dissects a galaxy's light at each point within the spectrograph's field of view. In this way, it is possible to construct a map of the motions of the stars within the galaxy and infer the distribution of the mass, both visible and invisible. IFS observations of the outskirts of a galaxy can provide insight into its global dynamics and past interactions, while IFS data on the innermost region can measure the mass of the supermassive black hole and the motions of the stars in its vicinity. (Gemini Observatory)

[Gaia untangles the starry strings of the Milky Way](#) (28 August 2019)

Rather than leaving home young, as expected, stellar 'siblings' prefer to stick together in long-lasting, string-like groups. The strings appear to be oriented in particular ways with respect to our galaxy's spiral arms, something that depends upon the ages of the stars within a string. This is especially evident for the youngest strings, comprising stars younger than 100 million years, which tend to be oriented at right angles to the spiral arm nearest to our Solar System. The nature of spiral arms is still debated, with the verdict on them being stable or dynamic structures not settled yet. Studying these older strings will help us understand if the arms are mostly static, or if they move or dissipate and re-form over the course of a few hundred million years, roughly the time it takes for the Sun to orbit around the galactic centre a couple of times. (ESA)

INTERNATIONAL SPACE STATION

[SNC selects ULA for Dream Chaser spacecraft launches](#) (14 August 2019)

(Sierra Nevada Corporation)

Sierra Nevada Corporation (SNC), the global aerospace and national security leader owned by Chairwoman and President Eren Ozmen and CEO Fatih Ozmen, selected United Launch Alliance (ULA) as the launch vehicle provider for the Dream Chaser® spacecraft's six NASA missions to the International Space Station. The Dream Chaser will launch aboard ULA's Vulcan Centaur rockets for its cargo resupply and return services to the space station, starting in 2021. Dream Chaser can launch from any conventional rocket.

[ASIM space observatory to be extended for two years](#) (19 August 2019)

The safety of the astronauts on board the International Space Station, ISS, is a top priority. Therefore, all the analyses must be reviewed to examine how an extension will affect the integrity of ASIM in space. The ASIM observatory has been operational since 13 April 2018. From its location on the ISS, the observatory is mapping giant lightnings and gamma-ray bursts in the upper atmosphere of Earth. In March 2019, Terma installed a software upgrade of the two scientific instruments onboard ASIM, from the control room in Brussels. This has enhanced the quality of the scientific data significantly. With the upgrade, researchers have been able to determine exactly where in the process of lightning gamma-ray bursts occur. They have gained much more insight into the anatomy of a lightning. In addition to gamma-ray bursts, recordings show plenty of blue jets spreading like fireworks over the thunderclouds. (Terma)

[U.S. Cygnus Space Freighter Departs Station](#) (8 August 2019)

The Cygnus spacecraft successfully departed the International Space Station three months after arriving at the space station to deliver 7,600 pounds of supplies and scientific experiments to the orbiting laboratory. The Cygnus spacecraft will now remain in orbit until mid-December and coincide with a second Cygnus spacecraft scheduled for launch to the space station in October. This will be the first extended duration flight to demonstrate spacecraft's capability to fly two Cygnus vehicles simultaneously and support hosted payloads for longer periods of time. (NASA)

JUPITER AND MOONS

[Mission to Jupiter's icy moon confirmed](#) (19 August 2019)

The mission will conduct an in-depth exploration of Jupiter's moon Europa and investigate whether the icy moon could harbour conditions suitable for life, honing our insights into astrobiology. To develop this mission in the most cost-effective fashion, NASA is targeting to have the Europa Clipper spacecraft complete and ready for launch as early as 2023. The agency baseline commitment, however, supports a launch readiness date by 2025. (JPL)

[ALMA shows what's inside Jupiter's storms](#) (20 August 2019)

New radio wave images made with the Atacama Large Millimeter/submillimeter Array (ALMA) provide a unique view of Jupiter's atmosphere down to fifty kilometres below the planet's visible (ammonia) cloud deck. ALMA enabled a three-dimensional map of the distribution of ammonia gas below the clouds. And for the first time, they were able to study the atmosphere below the ammonia cloud layers after an energetic eruption on Jupiter. The atmosphere of giant Jupiter is made of mostly hydrogen and helium, together with trace gases of methane, ammonia, hydrosulphide, and water. The top-most cloud layer is made up of ammonia ice. Below that is a layer of solid ammonia hydrosulphide particles, and deeper still, around 80 kilometres below the upper cloud deck, there likely is a layer of liquid water. The upper clouds form the distinctive brown belts and white zones seen from Earth. Many of the storms on Jupiter take place inside those belts. They can be compared to thunderstorms on Earth and are often associated with lightning events. Storms reveal themselves in visible light as small bright clouds, referred to as plumes. These plume eruptions can cause a major disruption of the belt, which can be visible for months or years. The ALMA images were taken a few days after amateur astronomers observed an eruption in Jupiter's South Equatorial Belt in January 2017. A small bright white plume was visible first, and then a large-scale disruption in the belt was observed that lasted for weeks after the eruption.

ALMA scientists studied the atmosphere below the plume and the disrupted belt at radio wavelengths and compared these to UV-visible light and infrared images made with other telescopes at approximately the same time. ALMA observations are the first to show that high concentrations of ammonia gas are brought up during an energetic eruption. The combination of observations simultaneously at many different wavelengths enabled them to examine the eruption in detail. This led to confirmation that the current theory that energetic plumes are triggered by moist convection at the base of water clouds, which are located deep in the atmosphere, is correct. The plumes bring up ammonia gas from deep in the atmosphere to high altitudes, well above the main ammonia cloud deck. (NRAO)

KILONOVA

[Astronomers find a golden glow from a distant stellar collision](#) (27 August 2019)

Astronomers re-examined data from a 2016 gamma-ray burst and found a signature that perfectly matches a gold- and platinum-producing explosion observed by LIGO in 2017. (University of Maryland)

MARS

[Thales Alenia Space cameras for ExoMars 2020 rover to take shots of the Martian surface](#) (20 August 2019)

Thales Alenia Space is presenting cameras developed by its Swiss subsidiary for the ExoMars 2020 program: two wide angle cameras (WAC) and the close-up imager (CLUPI). The two wide angle cameras (WAC), will be directly integrated in PanCam (The Panoramic Camera provided by European labs and universities), one of the instruments mounted on the ExoMars 2020 rover. PanCam will deliver images in the visible and near infrared wavelengths. The PanCam instrument, fitted with 12 filters, will be installed on the rover's mast. It will provide multispectral stereo images over a field of view of 38.3° (horizontal/vertical). The camera faces a daunting design challenge because of the wide range of temperatures it will experience, from -130°C (in survival mode) in the Martian environment, to +110°C because of the need for biological sterilization to protect the planet. The close-up imager (CLUPI) will be mounted directly on the drill arm, to provide close-up images of the Martian terrain, including surrounding rocks, soil and cliffs. It can focus at distances from 11.5 centimetres to infinity. This camera also features a focus stacking function, which entails combining several images with different focal planes depending on the distance, to transmit an image offering greater depth of field. The CMOS (Complementary metal-oxide semiconductor) photographic detector offers resolution of 2652 pixels x 1768 pixels. (Thales Alenia Space)

MOON

[The Moon and Mercury may have thick ice deposits](#) (2 August 2019)

The study used elevation data obtained by MESSENGER and LRO to measure approximately 15,000 simple craters with diameters ranging from 2.5 km to 15 km (about 1.5 miles to 9.3 miles) on Mercury and the Moon. Researchers found that craters become up to 10% shallower near the north pole of Mercury and the south pole of the Moon, but not the north pole of the Moon. The authors concluded that the most probable explanation for these shallower craters is the accumulation of previously undetected thick ice deposits on both worlds. Supporting this conclusion, the researchers found that the pole-facing slopes of these craters are slightly shallower than their equator-facing slopes, and that the shallowing is more

significant in regions that promote ice stability because of Mercury's orbit around the Sun. The topographic signal detected by the scientists is relatively more prominent in smaller simple craters but does not preclude the possibility that ice may be more widespread in larger craters across the lunar pole. (NASA Goddard)

[Orion's Service Module completes critical propulsion test](#) (6 August 2019)

NASA is building a system to send astronauts to the Moon for Artemis missions, and that includes tests to make sure the Orion spacecraft is prepared to safely carry crew on an alternate mission profile in the face of unexpected problems. That capability was most recently demonstrated with a successful, continuous 12-minute firing of Orion's propulsion system that simulated a possible alternate mission scenario. Inserting Orion into lunar orbit and returning the crew on a trajectory back home to Earth requires extreme precision in both plotting the course and firing the engines to execute that plan. (NASA)

[Astrobotic selects United Launch Alliance Vulcan Centaur rocket to launch its first mission to the Moon](#) (19 August 2019)

Astrobotic announced today that it selected United Launch Alliance's (ULA) Vulcan Centaur rocket in a competitive commercial procurement to launch its Peregrine lunar lander to the Moon in 2021. (Astrobotic)

[MDA to build robotic interfaces for Canadarm3 on NASA-led Gateway](#) (19 August 2019)

Maxar Technologies today announced it has been selected by NASA to build and perform a spaceflight demonstration of the lunar Gateway's power and propulsion element spacecraft. Blue Origin and Draper will join the Maxar-led team in designing, building and operating the spacecraft through the demonstration period. The power and propulsion element is a key component to NASA's overall plans to land American astronauts on the surface of the Moon by 2024 and will be the first segment of the Gateway tested in space. (MDA)

[Northrop Grumman completes qualification motor test for NASA's Orion Launch Abort System Attitude Control Motor](#) (23 August 2019)

Northrop Grumman Corporation announced today that it successfully completed the second qualification test of its Attitude Control Motor (ACM) for NASA's Orion spacecraft Launch Abort System (LAS). Preliminary results indicate all eight high pressure valves on the motor performed as expected under hot temperature conditions. The qualification test is a critical step toward Artemis 2, the first crewed mission of NASA's Deep Space Exploration Systems. (Northrop Grumman)

SOLAR SYSTEM

[NASA selects proposals to demonstrate SmallSat technologies to study interplanetary space](#) (15 August 2019)

NASA has selected two proposals to demonstrate small satellite technologies to improve science observations in deep space, which could help NASA develop better models to predict space weather events that can affect astronauts and spacecraft. Both proposals, funded at \$400,000 for nine-month mission concept studies, were selected based on potential technology and science value and the feasibility of development plans. They support NASA's heliophysics program, which seeks to better understand the nature of space throughout the solar system and how it changes in response to the constant outpouring of energy and particles from the Sun and how it interacts with planetary atmospheres. At the conclusion of the nine-month study period, one proposal will be selected to launch as a secondary payload

with NASA's Interstellar Mapping and Acceleration Probe (IMAP) spacecraft in October 2024. Taking advantage of NASA's cost-saving rideshare initiative, it will be accompanied by two other science missions, a NASA science mission of opportunity and a National Oceanic and Atmospheric Administration (NOAA) space weather forecasting mission.

The proposals for the technology demonstrations are:

- **Science-Enabling Technologies for Heliophysics (SETH)**
SETH would demonstrate two technologies. The first is an optical communications technology for small satellites and CubeSats that is less complex than current systems and could enable a hundredfold increase in deep space data rates, while reducing the burden on NASA's Deep Space Network. Such technology could help support future small satellite constellations that require high data rate communications systems. The second technology demonstration aboard SETH detects solar energetic neutral atoms, fast-moving atoms flowing from the Sun that do not have a charge, as well as an array of waves and other particles that erupt from our Sun. Called the HELio Energetic Neutral Atom (HELENA) detector, the instrument provides observations that could enable advanced warnings of potential space radiation threats to astronauts.
- **Solar Cruiser**
The Solar Cruiser investigation also demonstrates two technologies. A nearly 18,000-square-foot solar sail would demonstrate the ability to use solar radiation as a propulsion system. Such a system could provide views of the Sun not easily accessible with current technology. The coronagraph instrument would enable simultaneous measurements of the Sun's magnetic field structure and velocity of coronal mass ejections, or CMEs. These giant explosions of solar material are ejected into space and can set off space weather storms that, at their worst, interfere with utility grids on Earth. Improving data-gathering technology in this area is particularly useful for advance warning systems for at-risk infrastructure on Earth. (NASA)

STARS AND STAR CLUSTERS

[Glitch in neutron star reveals its hidden secrets](#) (12 August 2019)

Neutron stars are not only the densest objects in the Universe, they also rotate very fast and regularly. Until they suddenly don't. If parts of the neutron star interior start to move outwards, the star spins faster. This is called a "glitch," and it's providing astronomers with a brief insight into what lies within these mysterious objects. Located in the southern sky, and approximately 1,000 light years from Earth, the Vela Pulsar is known to glitch about once every three years. Only five percent of pulsars glitch, so the Vela Pulsar's regularity has made it a favourite of glitch hunters. Scientists had the first-ever detailed glimpse into the interior of the star – revealing that the inside actually has three different components. One of these components, a soup of superfluid neutrons in the inner layer of the crust, moves outwards first and hits the rigid outer crust of the star, causing it to spin up. Then, a second soup of superfluid that moves in the core catches up to the first, causing the spin of the star to slow back down. Immediately before the glitch the star seemed to slow down its rotation rate before spinning back up. This is the first time it's ever been seen. It may be related to the cause of the glitch. (McGill University)

SUN

[BITSE solar scope is ready for balloon flight over New Mexico](#) (23 August 2019)

NASA and the Korea Astronomy and Space Science Institute, or KASI, are getting ready to test a new way to see the Sun, high over the New Mexico desert. A balloon, large enough to hug a football field, is scheduled to take flight no earlier than Aug. 26, 2019, carrying beneath it a solar scope called BITSE. BITSE is a coronagraph, a kind of telescope that blocks the Sun's bright face in order to reveal its dimmer atmosphere, called the corona. Short for Balloon-borne Investigation of Temperature and Speed of Electrons in the corona, BITSE seeks to explain how the Sun spits out the solar wind. The solar wind is the stream of charged particles that constantly blows from the Sun's outer atmosphere, washing over the entire solar system. While scientists generally know where it forms, exactly how it does so remains a mystery. But unlocking the nature of the solar wind is key to predicting how solar eruptions travel. The solar wind is a bit like a water slide: its flow determines how a solar storm barrels through space. Sometimes, the storms crash into Earth's magnetic field, sparking disturbances that can interfere with satellites and everyday communications systems like radio or GPS. BITSE demonstrates a new way to study the solar wind. While standard coronagraphs capture the corona's density, BITSE also measures the temperature and speed of electrons in the solar wind to help understand the powerful forces that accelerate them to speeds of 1 million miles per hour. BITSE's balloon flight is a key step in the testing and development of this instrument and will help the team of scientists and engineers fine-tune their technology for future spaceflight. (NASA Goddard)

SUPERNOVA

[Scientists observe the explosion of a monster star requiring new supernova mechanism](#) (15 August 2019)

Scientists at the Centre for Astrophysics | Harvard & Smithsonian have announced the discovery of the most massive star ever known to be destroyed by a supernova explosion, challenging known models of how massive stars die and providing insight into the death of the first stars in the universe. First noticed in November 2016 by the European Space Agency's (ESA) Gaia satellite, three years of intensive follow up observations of the supernova SN2016iet revealed characteristics, incredibly long duration and large energy, unusual chemical fingerprints, and an environment poor in metals, for which there are no analogues in the existing astronomical literature. Everything about this supernova looks different, its change in brightness with time, its spectrum, the galaxy it is located in, and even where it's located within its galaxy. We sometimes see supernovas that are unusual in one respect, but otherwise are normal; this one is unique in every possible way. The observations and analysis show that SN2016iet began as an incredibly massive star 200 times the mass of Earth's Sun that mysteriously formed in isolation roughly 54,000 light years from the centre of its host dwarf galaxy. The star lost about 85 percent of its mass during a short life of only a few million years, all the way up to its final explosion and demise. The collision of the explosion-debris with the material shed in the final decade before explosion led to SN2016iet's unusual appearance, providing scientists with the first strong case of a pair-instability supernova. The idea of pair-instability supernovas has been around for decades, but finally having the first observational example that puts a dying star in the right regime of mass, with the right behaviour, and in a metal-poor dwarf galaxy is an incredible step forward. SN2016iet represents the way in which the most massive stars in the universe, including the first stars, die. (Centre for Astrophysics - Harvard & Smithsonian)

TECHNOLOGY

[Collaborating with CHARM – a new UK astronomy instrument is set for Mexico](#)

(5 August 2019)

A new instrument to help astronomers understand how stars are born is bound for the Large Millimetre Telescope (LMT) in Mexico. Called CHARM, the instrument was developed by a world leading team of experts in the UK and will be integrated onto the LMT, Mexico's largest ever investment in science infrastructure. The project was supported by the UK Government's Global Challenges Research Fund, which aims to strengthen partnerships between the UK and developing countries, including Mexico and to foster talent and innovation around the world. The Collaborative Heterodyne Astronomical Receiver for Mexico (CHARM) instrument will be the first at the telescope to operate using wavelengths of light less than a millimetre in length. It will enhance the telescope's ability to see the molecules that make up interstellar clouds of dust and the role they play through the lifecycle of stars. The LMT was one of the observatories involved in imaging the blackhole earlier in the year. (STFC)

[Northrop Grumman becomes first commercial partner to use VAB](#) (16 August 2019)

After spending more than 50 years supporting NASA's human spaceflight programs, the Vehicle Assembly Building (VAB), a landmark at the agency's Kennedy Space Centre in Florida, is getting its first commercial tenant. Northrop Grumman will assemble and test its new Omega rocket inside the massive facility's High Bay 2, one of four high bays in the building. (NASA Kennedy)

[Brookhaven completes LSST's digital sensor array](#) (19 August 2019)

After 16 years of dedicated planning and engineering, scientists at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory have completed a 3.2 gigapixel sensor array for the camera that will be used in the Large Synoptic Survey Telescope (LSST), a massive telescope that will observe the universe like never before. It is the biggest charge-coupled device (CCD) array that has ever been built. It has three billion pixels. No telescope has ever put this many sensors into one camera. The digital sensor array is composed of about 200 16-megapixel sensors, divided into 21 modules called "rafts." Each raft can function on its own, but when combined, they will view an area of sky that can fit more than 40 full moons in a single image. Researchers will stitch these images together to create a time-lapse movie of the complete visible universe accessible from Chile. Currently under construction on a mountaintop in Chile, LSST is designed to capture the most complete images of our universe that have ever been achieved. The project to build the telescope facility and camera is a collaborative effort among more than 30 institutions from around the world, and it is primarily funded by DOE's Office of Science and the National Science Foundation. DOE's SLAC National Accelerator Laboratory is leading the overall effort to construct the camera, the world's largest camera for astronomy, while Brookhaven led the design, construction, and qualification of the digital sensor array, the "digital film" for the camera. (Brookhaven National Laboratory)

[NASA activates deep space atomic clock](#) (26 August 2019)

An atomic clock that could pave the way for autonomous deep space travel was successfully activated and is ready to begin its year-long tech demo. Launched in June, NASA's Deep Space Atomic Clock is a critical step toward enabling spacecraft to safely navigate themselves in deep space rather than rely on the time-consuming process of receiving directions from Earth. (JPL)

Pat Williams August 2019