Space News Update – November 2018

By Pat Williams

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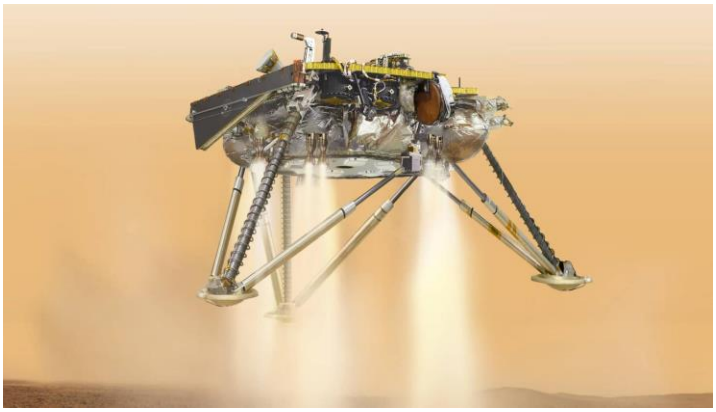
Disclaimer - I claim no authorship for the printed material; except where noted (PW).

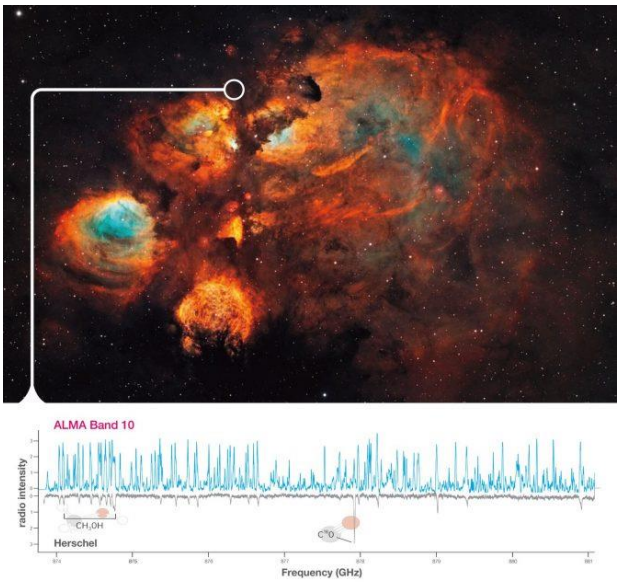
NASA INSIGHT LANDER ARRIVES ON MARTIAN SURFACE



Artist impression of NASA's InSight lander [PA]

NASA's Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) lander successfully touched down on the Red Planet after an almost seven-month, 300-million-mile (458-million-kilometer) journey from Earth. InSight hit the Martian atmosphere at 12,300 mph (19,800 kilometres per hour), and the whole sequence to touching down on the surface took only six-and-a-half minutes. During that short span of time, InSight had to autonomously perform dozens of operations and do them flawlessly and by all indications that is exactly what the spacecraft did. It will operate on the surface for one Martian year, plus 40 Martian days, or sols, until Nov. 24, 2020. (JPL)
NASA InSight lander arrives on Martian surface (27 November 2018)

ALMA'S HIGHEST FREQUENCY RECEIVER PRODUCES ITS FIRST SCIENTIFIC RESULT ON MASSIVE STAR FORMATION



The Atacama Large Millimeter/submillimeter Array (ALMA) has opened another new window to the Universe. Using its highest frequency receivers yet, researchers obtained 695 radio signals from various molecules, including simple sugar, in the direction of a massive star forming region, and revealed a pair of water vapor fountains erupting from the region. These first scientific results from the ALMA Band 10 receivers developed in Japan ensure a promising future for high frequency observations. (ALMA)
ALMA's highest frequency receiver produces its first scientific result on massive star formation (22 November 2018)

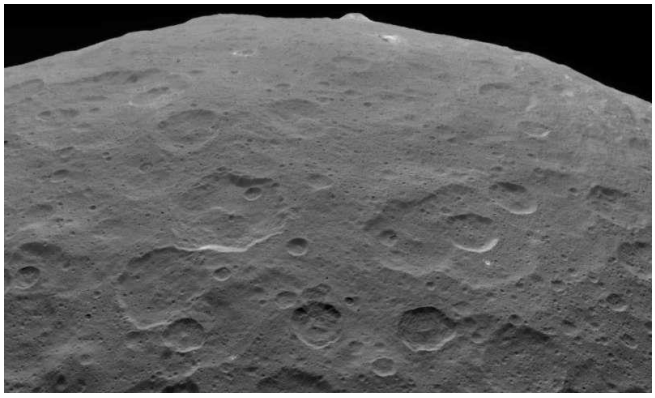
FOR ARID, MARS-LIKE DESERT, RAIN BRINGS DEATH

Carlos González-Silva/Provided A small, ephemeral lagoon in the hyper-arid core of the Atacama Desert.

When rains fell on the arid Atacama Desert the water brought death. A team of planetary astrobiologists has found that after encountering never-before-seen rainfall three years ago at the arid core of Chile's Atacama Desert, the heavy precipitation wiped out most of the microbes that had lived there. They found that rain in the hyper arid core of the Atacama Desert caused a massive extinction of most of the indigenous microbial species there. The hyper dry soils before the rains were inhabited by up to 16 different, ancient microbe species.

After it rained, there were only two to four microbe species found in the lagoons. The extinction event was massive. The core of Atacama rarely, if ever, sees rain. But thanks to changing climate over the Pacific Ocean that part of the desert experienced rain events on March 25 and Aug. 9, 2015. It rained again on June 7, 2017. Climate models suggest that similar rain events may take place about once every century, but there has been no evidence of rain for the past 500 years. The surprise precipitation has two implications for the biology of Mars. Large deposits of nitrates at the Atacama Desert offer evidence of long periods of extreme dryness. These nitrate deposits are food for microbes. The nitrates concentrated at valley bottoms and former lakes about 13 million years ago. Nitrate deposits are the evidence. This may represent an analog to the nitrate deposits recently discovered on Mars by the rover Curiosity. Another implication may go back four decades. With this new knowledge, the researchers believe that science may want to revisit the Viking experiments on Mars from the 1970s, which involved incubating Martian soil samples in aqueous solutions. The results show for the first time that providing suddenly large amounts of water to microorganisms, exquisitely adapted to extract meager and elusive moisture from the most hyper dry environments, will kill them from osmotic shock. (Cornell University)
For arid, Mars-like desert, rain brings death (12 November 2018)

DAWN MISSION TO ASTEROID BELT COMES TO END



This photo of Ceres and one of its key landmarks, Ahuna Mons, was one of the last views Dawn transmitted before it completed its mission. This view, which faces south, was captured on Sept. 1 at an altitude of 2220 miles (3570 kilometres) as the spacecraft was ascending in its elliptical orbit. Image Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

NASA's Dawn spacecraft has gone silent, ending a historic mission that studied time capsules from the solar system's earliest chapter. Dawn missed scheduled communications sessions with NASA's Deep Space Network on Wednesday, Oct. 31, and Thursday, Nov. 1. After the flight team eliminated other possible causes for the missed communications, mission managers concluded that the spacecraft finally ran out of hydrazine, the fuel that enables the spacecraft to control its pointing. Dawn can no longer keep its antennas trained on Earth to communicate with mission control or turn its solar panels to the Sun to recharge. The Dawn spacecraft launched 11 years ago to visit the two largest objects in the main asteroid belt. Currently, it's in orbit around the dwarf planet Ceres, where it will remain for decades. (NASA) Dawn mission to asteroid belt comes to end (1 November 2018)

NASA ANNOUNCES NEW PARTNERSHIPS FOR COMMERCIAL LUNAR PAYLOAD DELIVERY SERVICES

Credit: NASA

Nine U.S. companies now are eligible to bid on NASA delivery services to the lunar surface through Commercial Lunar Payload Services (CLPS) contracts, as one of the first steps toward long-term scientific study and human exploration of the Moon and eventually Mars. They will be able to bid on delivering science and technology payloads for NASA, including payload integration and operations, launching from Earth and landing on the surface of the Moon. NASA expects to be one of many customers that will use these commercial landing services. This announcement marks tangible progress in America's return to the Moon's surface to stay. The innovation of America's aerospace companies, wedded to big goals in science and human exploration, are going to help achieve amazing things on the Moon and feed forward to Mars. (NASA)
NASA announces new partnerships for commercial lunar payload delivery services
(29 November 2018)

EARTH'S MAGNETIC FIELD MEASURED USING ARTIFICIAL STARS AT 90 KILOMETRES ALTITUDE

photo/©: Felipe Pedreros Bustos
The experiment on La Palma: The laser beam (yellow) generates an artificial guide star in the mesosphere. This light is collected in the receiver telescope (front left). The laser source and the receiver telescope are eight meters away from each other.

The mesosphere, at heights between 85 and 100 kilometers above the Earth's surface, contains a layer of atomic sodium. Astronomers use laser beams to create artificial stars, or laser guide stars (LGS), in this layer for improving the quality of astronomical observations. In 2011, researchers proposed that artificial guide stars could also be used to measure the Earth's magnetic field at this altitude. An international group of scientists has recently managed to do this with a high degree of precision. The technique may also help to identify magnetic structures in the solid Earth's lithosphere, to monitor space weather, and to measure electrical currents in the part of the atmosphere called ionosphere. A laser beam is directed from the ground into the atmosphere. In the sodium layer, it strikes sodium atoms, which absorb the energy of the laser and then start to glow. The atoms emit light in all directions. Such artificial stars are barely visible to the naked eye but can be observed with telescopes. The artificial guide stars help astronomers to correct the distortions of light that travels through the atmosphere. The light from the artificial guide star is collected on the ground by telescopes, and the information is used to adjust in real time state-of-the-art deformable mirrors, compensating the distortions and allowing astronomical objects to be imaged sharply, down to the optical resolution, the so-called diffraction limit, of the telescope. (Johannes Gutenberg University Mainz)
Earth's magnetic field measured using artificial stars at 90 kilometres altitude
(14 November 2018)

LINKS TO OTHER SPACE NEWS PUBLISHED IN NOVEMBER 2018

ASTEROIDS

OSIRIS-REx flexes its "arm" before arriving at asteroid Bennu (16 November 2018)
TAGSAM, or Touch-and-Go Sample Acquisition Mechanism, completed a successful practice deployment in space on Nov. 14. This is an important milestone in the OSIRIS-REx mission to the asteroid Bennu. TAGSAM is the first-of-its-kind robotic arm and sampling head invented by Lockheed Martin. Lockheed Martin engineers on the Mission Support Area (MSA) team moved TAGSAM's arm through the full range of motion of all its "joints"; shoulder, elbow and wrist. The maneuver demonstrates that TAGSAM is ready to collect surface material (regolith) from Bennu. (Lockheed Martin)

Odd bodies, rapid spins keep cosmic rings close (19 November 2018)
Forget those shepherding moons. Gravity and the odd shapes of asteroid Chariklo and dwarf planet Haumea, small objects deep in our solar system, can be credited for forming and maintaining their own rings. Chariklo and Haumea were the first small objects known to have rings. This research shows that a topographic anomaly on the object, such as a mountain, may play a similar gravitational role as a “moon” to hold the rings together. In addition to gravity, rapidly spinning cosmic bodies that create specific resonance also keep rings from expanding, dissipating and disappearing. (Cornell University)

ASTROPHYSICS

Bose-Einstein condensate generated in space for the first time (31 October 2018)
The MAIUS 1 (Matter-Wave Interferometry in Microgravity) experiment could be described

as one of the most complex experiment ever flown on a sounding rocket. MAIUS 1 was launched on 23 January 2016 on board a sounding rocket from the Esrange Space Center near Kiruna in northern Sweden. During the approximately six-minute microgravity phase of the flight, German scientists succeeded in producing a Bose-Einstein condensate (BEC) in space for the first time and performing atom interferometry experiments with them. Bose-Einstein condensates are produced when a gas is cooled down to close to absolute zero. During the microgravity phase, around 100 individual experiments were carried out on different aspects of matter-wave interferometry. (Johannes Gutenberg University Mainz)

Auroras unlock the physics of energetic processes in space (15 November 2018)
The team remotely observed rapidly evolving aurora to understand the physics behind why, when and how energy is released as the source of the aurora explosively reconfigures. Somewhere in the huge volume of space into which Earth's magnetosphere stretches, this energy release occurs via instability which is really hard to pinpoint. They cause sub storms whereby charged particles surf into the Earth's atmosphere on electromagnetic waves, releasing large amounts of energy and lighting up the aurora. By studying auroras closely, we can map back to where in space the instabilities are occurring and study the physics that cause them. The team scanned a large portion of the sky and found the perfect sub storm located over Poker Flats in Alaska on 18 September 2012. They tracked the aurora as it moved towards the northern pole over a four-minute period. The aurora began as a line of 'auroral beads' along an arc which grew exponentially in brightness and size. These growing ripples are a hallmark of an instability in space. By comparing these detailed characteristics from the aurora with state-of-the-art theory, the team could narrow down the area of space where the instability most likely is. This method allows the researchers to predict what the instability is and where it is in space. In fact, the region identified is incredibly small in space terms, only a small fraction of the volume of the Earth. Until now, scientists have been able to describe aurora and high energy events that occur on the Sun and other planets within the solar system, but this is the first time real physical analysis has been done.
"Importantly, our work has given scientists more physics to work with. A whole range of theoretical models can be tested and refined based on the physical characteristics we've captured," added co-author Dr Clare Watt (University of Reading). They now look forward to pinpointing this epi-centre in space and finding out what makes it unstable.
(University College London)

BLACK HOLES

Astronomers get best view yet of supermassive black holes in merging galaxies
(7 November 2018)
Two galaxies, drawn together by the force of gravity, are merging into a tangled mass of dense gas and dust. Structure is giving way to chaos but hiding behind this messy cloud of material are two supermassive black holes, nestled at the centre of each of the galaxies, that are now excitingly close, giving astronomers the best view yet of the pair marching toward coalescence into one mega black hole. (W. M. Keck Observatory)

EARTH

Massive impact crater from a kilometre-wide iron meteorite discovered in Greenland
(14 November 2018)
The crater measures more than 31 km in diameter, corresponding to an area bigger than Paris,

and placing it among the 25 largest impact craters on Earth. The crater formed when a kilometre-wide iron meteorite smashed into northern Greenland but has since been hidden under nearly a kilometre of ice. The crater is exceptionally well-preserved, and that is surprising, because glacier ice is an incredibly efficient erosive agent that would have quickly removed traces of the impact. But that means the crater must be rather young from a geological perspective. So far, it has not been possible to date the crater directly, but its condition strongly suggests that it formed after ice began to cover Greenland, so younger than 3 million years old and possibly as recently as 12,000 years ago – toward the end of the last ice age. (University of Copenhagen)

GHGSat selects Arianespace to launch GHGSat-C1 on Vega (15 November 2018)
The GHGSat-C1 spacecraft's purpose is to measure greenhouse gases emissions from industrial facilities around the world. The Vega Proof of Concept flight (POC flight) is the first mission of the Small Spacecraft Mission Service (SSMS) a program initiated by the European Space Agency in 2016, with the contribution of the European Commission. For all the European partners involved, its purpose is to perfectly address the burgeoning microsatellite market for both institutional and commercial needs with a new rideshare concept on the Vega light launcher. (Arianespace)

DLR assists civil aviation with information about space weather (28 November 2018)
The International Civil Aviation Organization (ICAO) has designated three global space weather service centres to assist aviation with observations and forecasts of near-Earth space and atmospheric conditions during strong solar storms. One of these centres will be set up by the Pan-European Consortium for Aviation Space Weather User Services (PECASUS) under the leadership of the Finnish Meteorological Institute (FMI). With its many years of experience in observing and modelling ionospheric plasma, the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) will provide data on the current state of the ionosphere. These data are used by PECASUS to provide the aviation industry with information about possible disruptions to satellite navigation and communications systems. (DLR)

EXOPLANETS

Aluminium oxide found in an ultra-hot Jupiter (7 November 2018)
A detailed determination of the chemical composition of ultra-Hot Jupiters has the potential to challenge current models of exoplanet atmospheres. There is a close symbiosis between models and observations, of which this study is a good example, as it unveils the first sign of aluminium oxide in the atmosphere of WASP-33b, as theory predicted.
(Instituto de Astrofísica de Canarias)

Super-Earth orbiting Barnard's Star (14 November 2018)
A planet has been detected orbiting Barnard's Star, a mere 6 light-years away. This breakthrough is a result of the Red Dots and CARMENES projects, whose search for local rocky planets has already uncovered a new world orbiting our nearest neighbour, Proxima Centauri. The planet, designated Barnard's Star b, now steps in as the second-closest known exoplanet to Earth. The gathered data indicate that the planet could be a super-Earth, having a

mass at least 3.2 times that of the Earth, which orbits its host star in roughly 233 days. Barnard's Star, the planet's host star, is a red dwarf, a cool, low-mass star, which only dimly illuminates this newly-discovered world. Light from Barnard's Star provides its planet with only 2% of the energy the Earth receives from the Sun. (ESO)

Study brings new climate models of small star TRAPPIST 1's seven intriguing worlds (20 November 2018)
The team found that due to an extremely hot, bright early stellar phase, all seven of the star's worlds may have evolved like Venus, with any early oceans they may have had evaporating and leaving dense, uninhabitable atmospheres. However, one planet, TRAPPIST-1 e, could be an Earthlike ocean world worth further study. TRAPPIST-1, 39 light-years or about 235 trillion miles away, is about as small as a star can be and still be a star. A relatively cool "M dwarf" star it has about 9 percent the mass of the sun and about 12 percent its radius. TRAPPIST-1 has a radius only a little bigger than the planet Jupiter, though it is much greater in mass. (University of Washington)

GALAXIES

ALMA and MUSE detect galactic fountain (6 November 2018)
A mere one billion light-years away in the nearby galaxy cluster known as Abell 2597, there lies a gargantuan galactic fountain. A massive black hole at the heart of a distant galaxy has been observed pumping a vast spout of cold molecular gas into space, which then rains back onto the black hole as an intergalactic deluge. The in-and outflow of such a vast cosmic fountain has never before been observed in combination and has its origin in the innermost 100 000 light-years of the brightest galaxy in the Abell 2597 cluster. (ESO)

INTERNATIONAL SPACE STATION

Northrop Grumman set to launch 10th cargo delivery mission to the International Space Station for NASA (14 November 2018)
Northrop Grumman Corporation announced it is set to launch the company's Antares™ rocket carrying its Cygnus™ cargo spacecraft to the International Space Station for NASA. Pending completion of final vehicle testing and acceptable local weather conditions, the launch will take place November 16. Northrop Grumman's AntaresTM rocket is set to launch its CygnusTM cargo spacecraft to the International Space Station for the company's 10th cargo resupply mission for NASA. The Antares medium-class rocket will carry a cargo load of approximately 7,400 pounds (3,350 kilograms) of vital supplies and scientific equipment to support the crew aboard the International Space Station. The Cygnus spacecraft is scheduled to rendezvous and berth with the station on November 18, 2018.
(Northrop Grumman)

Northrop Grumman launches 10th Cargo delivery mission to the International Space Station (17 November 2018)
The Antares medium-class rocket carried approximately 7,400 pounds (3,350 kilograms) of vital supplies and scientific equipment aboard Cygnus. The spacecraft will remain attached to the space station for approximately two months before departing with up to 7,400 pounds (approximately 3,350 kilograms) of disposal cargo. Cygnus' large pressurized volume allows

for large amounts of cargo to be efficiently carried to the space station and also provides significant cargo disposal capability, which is a critical service for NASA and unique among America's commercial cargo providers. (Northrop Grumman)

NanoRacks provides triple-altitude delivery for customers in single space station launch (19 November 2018)
For the first time ever, NanoRacks has booked customers on three different altitudes on one commercial resupply launch. The first delivery will be a research experiment to the astronauts on station. Then the spacecraft is planned to manoeuvre to a higher altitude where the sixth NanoRacks External Cygnus Deployment Program mission will deploy two of three CubeSats on board into orbit, MySat-1 and the second CHEFSat satellite. Finally, NanoRacks will deliver the final customer payload in a third altitude. Northrop Grumman will direct Cygnus below the ISS to deploy KickSat-2, which is being launched as the sole CubeSat in the Educational Launch of Nanosatellites-16 (ELaNa-16) mission complement, sponsored by the NASA Launch Services Program (LSP). KickSat-2 is being deployed well below the International Space Station altitude due to the satellite sub-deploying smaller "ChipSats," a prototype representing a disruptive new space technology. These ChipSats, also known as "Sprites," are tiny spacecraft that include power, sensors, and communication systems on a printed circuit board measuring 3.5 by 3.5 centimeters, with a thickness of just a few millimeters and a mass of just a few grams. The ChipSats are expected to be in orbit for only a few days before burning up. (NanoRacks)

MARS

Oxia Planum favoured for ExoMars surface mission (9 November 2018)
The ExoMars Landing Site Selection Working Group has recommended Oxia Planum as the landing site for the ESA-Roscosmos rover and surface science platform that will launch to the Red Planet in 2020. The proposal will be reviewed internally by ESA and Roscosmos with an official confirmation expected mid-2019. (ESA)

DLR's HP3 Mole on board NASA's InSight mission soon to land on Mars (19 November 2018)
It will be the deepest hole ever hammered into another celestial body using manmade technology. During the NASA InSight mission, the Heat Flow and Physical Properties Package (HP3), the Mole will penetrate up to five metres deep into the Martian soil to measure the temperature and thermal conductivity of the substrate materials there. This glimpse of the interior of the Red Planet will help us to better understand the formation and evolution of Earth-like bodies. The landing is scheduled to take place at 20:53 CET on 26 November 2018 on the Elysium Planitia plain, a bit north of the Martian equator. Until now, heat flow measurements have only been performed on the Moon, as part of the Apollo 17 mission, during which the astronauts Eugene Cernan and Jack Schmitt used a hand-powered drill to bore up to three metres into the surface. (DLR)

Overflowing crater lakes carved canyons across Mars (16 November 2018)
Today, most of the water on Mars is locked away in frozen ice caps. But billions of years ago it flowed freely across the surface, forming rushing rivers that emptied into craters, forming lakes and seas. New research led by The University of Texas at Austin has found evidence that sometimes the lakes would take on so much water that they overflowed and burst from

the sides of their basins, creating catastrophic floods that carved canyons very rapidly, perhaps in a matter of weeks. The findings suggest that catastrophic geologic processes may have had a major role in shaping the landscape of Mars and other worlds without plate-tectonics. (University of Texas at Austin)

NASA announces landing site for Mars 2020 Rover (19 November 2018)
NASA has chosen Jezero Crater as the landing site for its upcoming Mars 2020 rover mission after a five-year search, during which every available detail of more than 60 candidate locations on the Red Planet was scrutinized and debated by the mission team and the planetary science community. The rover mission is scheduled to launch in July 2020 as NASA's next step in exploration of the Red Planet. It will not only seek signs of ancient habitable conditions and past microbial life, but the rover also will collect rock and soil samples and store them in a cache on the planet's surface. NASA and ESA (European Space Agency) are studying future mission concepts to retrieve the samples and return them to Earth, so this landing site sets the stage for the next decade of Mars exploration. (NASA)

Lockheed Martin and NASA JPL successfully land on Mars (26 November 2018)
NASA has a new spacecraft operating on the surface of Mars. The InSight Mars Lander, which was designed, built and tested by Lockheed Martin (NYSE: LMT), navigated the dramatic entry and descent through the Martian atmosphere and touched down on Elysium Planitia in the equatorial region of Mars. Lockheed Martin is the prime contractor responsible for the complete spacecraft system; cruise stage, aeroshell and the lander itself. Mission management and navigation were handled by NASA Jet Propulsion Laboratory (JPL) and spacecraft operations were performed by engineers at Lockheed Martin Space's Mission Support Area in Littleton, Colorado. (Lockheed Martin)

MOON

RUAG Space participates in the development of the Lunar Orbital Platform-Gateway (1 November 2018)
Chosen by Airbus Defence and Space, RUAG Space will oversee the development of the structure and thermal subsystem of the ESPRIT module, the European System Providing Refuelling, Infrastructure and Telecommunications for a station orbiting the Moon called Lunar Orbital Platform-Gateway. The Lunar Orbital Platform will be the new manned platform following the International Space Station. Airbus has been awarded one of two parallel contracts by ESA for the phase A/B1 of the development of the ESPRIT. (RUAG Space)

Lockheed Martin selected for NASA's commercial lunar lander payload services contract (29 November 2018)
Lockheed Martin will apply its expertise in interplanetary spacecraft to a new program designed to deliver commercial payloads to the surface of the Moon. NASA announced today they have selected Lockheed Martin's McCandless Lunar Lander to provide payload delivery services as part of the agency's Commercial Lunar Payload Services (CLPS) contract. Lockheed Martin's lander design builds on four decades of experience engineering deep space missions, including Mars landers. The McCandless Lunar Lander is based on the

proven design of the InSight lander, which just touched down on the Martian surface on Monday, Nov. 26 and the Phoenix lander which successfully arrived at Mars in May 2008. (Lockheed Martin)

Astrobotic selected by NASA to be a lunar delivery provider (29 November 2018)
NASA recently awarded Astrobotic two contracts that could help move the Pittsburgh-based company closer to making its first lunar landing. The contracts are for developing technologies for the company's Peregrine lander but could possibly make lunar landings easier and more accessible to others in the future. The first contract is a $10 million "Tipping Point" award from NASA's Space Technology and Mission Directorate for the development of a terrain relative navigation (TRN) sensor for precise lunar landings. TRN is being designed to allow the spacecraft to land with unprecedented levels of accuracy at some of the most challenging landing sites on the Moon. These include areas of promising scientific exploration and compelling economic opportunity, such as lunar skylights and the permanently-shadowed ice-rich poles of the Moon.

SATELLITES

One giant thrust for space propulsion (1 November 2018)
Belfast has become a key manufacturing hub for UK space technology after the announcement that a radically new, all-electric propulsion system for Europe's latest communications satellite is being built in the city. Thales UK announced that manufacturing of the Xenon Propulsion System (XPS), at its new £6 million space propulsion centre has achieved a major production milestone with the completion of the first engine module ready for delivery. The engine modules produced in Belfast will propel the Spacebus Neo satellite, built by Thales Alenia Space in France. The Spacebus Neo platform has been developed under the European Space Agency's Neosat satellite programme. This protoflight Spacebus NEO platform will be launched in 2019 as the Konnect communications satellite, operated by Eutelsat to deliver high speed internet to sparsely populated and isolated regions.
(Thales Alenia Space)

New ESA facility puts satnav at the service of science (9 November 2018)
Global satellite navigation systems are continuously bathing Earth in satnav signals. As well as helping in our daily lives, these signals are also tools for cutting-edge science. A new ESA facility, based at ESA's astronomy centre near Madrid, is championing their use for everything from Earth monitoring to fundamental physics. (ESA)

ICEYE-X2 SAR satellite to be launched on upcoming spaceflight SSO-A: SmallSat Express mission (8 November 2018)
ICEYE, an Earth observation company creating the world's largest Synthetic-aperture radar (SAR) satellite constellation, today confirmed it is launching the company's second SAR satellite, ICEYE-X2, into low Earth orbit on Spaceflight's SSO-A: SmallSat Express mission. The mission is currently targeted to launch on November 19th from the Vandenberg Air Force Base in California aboard a SpaceX Falcon 9 rocket. ICEYE's radar satellite imaging service, with coverage of selected areas every few hours, both day and night, helps clients resolve challenges in sectors such as maritime, disaster management, insurance, finance,

security and intelligence. ICEYE is the first organization in the world to successfully launch synthetic-aperture radar (SAR) satellites with a launch mass under 100 kg. (ICEYE)

Eu:CROPIS life support system – greenhouses to be launched to space (15 December 2018)
Eu:CROPIS stands for 'Euglena and Combined Regenerative Organic-food Production in Space'. This mission seeks to show that urine can be converted into nutrients even under lunar and Martian gravity conditions. Inside the satellite are two greenhouses, each maintained as a pressurised closed loop system. The core elements of these systems are a biofilter and green algae (Euglena gracilis). The biofilter consists of a 400-millilitre chamber filled with lava stones. Bacteria have settled on and within these porous stones, which convert the urine flowing over them into nitrate in a water cycle. (DLR)

SSTL announces 35kg lunar comms mission for 2021 (28 November 2018)
Surrey Satellite Technology Ltd (SSTL) has today announced that it is designing a low cost 35kg lunar communications satellite mission called DoT-4, targeted for a 2021 launch. DoT-4 will provide the communications relay back to Earth using the Goonhilly Deep Space Network and will link up with a rover on the surface of the Moon. (SSTL)

Blue Canyon Technologies awarded first Phase 1 contract of DARPA's Blackjack program (28 November 2018)
U.S. military researchers are looking to Blue Canyon Technologies in Boulder, Colo., to help develop a constellation of small, secure, and affordable military satellites that not only are able to operate in low-Earth orbit (LEO), but also that capitalize on modern commercial satellite technologies. Officials of the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., announced a $1.5 million contract to Blue Canyon for the Blackjack program to develop SWaP-optimized military communications and surveillance satellites designed to operate in LEO. Blackjack seeks to develop low-cost space payloads and commoditized satellite buses with low size, weight, power, and cost (SWaP-C) with similar capabilities as today's military communications that operate at geosynchronous orbit (GEO), but at a fraction of the cost. Military satellites are critical to U.S. warfighting capabilities. Traditionally they are placed in GEO to deliver persistent overhead access to any point on the globe. Yet in the increasingly contested space environment, these costly and monolithic systems are vulnerable targets that would take years to replace if degraded or destroyed. Moreover, their long development schedules make it difficult or impossible to respond quickly to new threats. Blue Canyon has developed low-cost high-reliability spacecraft systems and components. (Blue Canyon Technologies)

SCIENCE MISSIONS

Extended life for ESA's science missions (14 November 2018)
ESA's Science Programme Committee (SPC) has confirmed the continued operations of ten scientific missions in the Agency's fleet up to 2022. After a comprehensive review of their scientific merits and technical status, the SPC has decided to extend the operation of the five missions led by ESA's Science Programme: Cluster, Gaia, INTEGRAL, Mars Express, and XMM-Newton. The SPC also confirmed the Agency's contributions to the extended operations of Hinode, Hubble, IRIS, SOHO, and ExoMars TGO. (ESA)

STARS AND STAR CLUSTERS

Elusive star has origins close to Big Bang (5 November 2018)
Astronomers at Johns Hopkins University have found what could be one of the universe's oldest stars, a body almost entirely made of materials spewed from the Big Bang. The discovery of this approximately 13.5 billion-year-old tiny star means more stars with very low mass and very low metal content are likely out there, perhaps even some of the universe's very first stars. The star is unusual because, unlike other stars with very low metal content, it is part of the Milky Way's "thin disk", the part of the galaxy in which our own sun resides. And because this star is so old, researchers say it's possible that our galactic neighborhood is at least 3 billion years older than previously thought. (Johns Hopkins University)

SOFIA unravels the mysterious formation of star clusters (6 November 2018)
The sun, like all stars, was born in a giant cold cloud of molecular gas and dust. It may have had dozens or even hundreds of stellar siblings – a star cluster – but these early companions are now scattered throughout our Milky Way galaxy. Although the remnants of this particular creation event have long since dispersed, the process of star birth continues today within our galaxy and beyond. Star clusters are conceived in the hearts of optically dark clouds where the early phases of formation have historically been hidden from view. But these cold, dusty clouds shine brightly in the infrared, so telescopes like the Stratospheric Observatory for Infrared Astronomy, SOFIA, can begin to reveal these long-held secrets. Astronomers using SOFIA's instrument, the German Receiver for Astronomy at Terahertz Frequencies, known as GREAT, have found new evidence that star clusters form through collisions between giant molecular clouds. (NASA)

Aging a flock of stars in the Wild Duck Cluster (7 November 2018)
Astronomers have long believed that many open clusters consist of a single generation of stars because once stars have formed, their radiation blows away nearby material needed to make new stars. But in the Wild Duck Cluster, known by scientists as Messier 11, or M11, stars of the same brightness appear in different colors, suggesting they are of different ages. Unless scientists had missed important clues about stellar evolution, there had to be another explanation for the spread of colors in this accumulation of about 2,900 stars. The stars in the Wild Duck Cluster, it turns out, are spread out in the color spectrum not because of different ages, but because of different rotational periods. (University of Arizona)

Once-in-a-lifetime observations by Veritas astronomers reveal high energy gamma-rays from a binary star system (13 November 2018)
A new discovery might lay claim to title of the most unusual extreme class of astronomical object: very high energy (VHE) gamma-ray emitting, neutron star-massive star binary pairs. Of the one-hundred billion stars in our galaxy, fewer than ten are in known to be in gamma-ray binary systems, with this discovery being only the second with an identified neutron star. The gamma-ray emission was discovered during an event that will not happen again until 2067. (Harvard-Smithsonian Center for Astrophysics)

Astronomers find picture of hefty star before it blew up (15 November 2018)
The type Ic supernova, called SN 2017ein, was initially discovered in May 2017 by researchers using the Tenagra Observatories in Arizona. It is located in a spiral galaxy called NGC 3938, about 65 million light-years away. The Caltech astronomy team was able to track down this supernova's progenitor using archival images from NASA's Hubble Space Telescope, taken in 2007. (Caltech)

SUN

NASA team to fly first-ever coronagraph capable of determining the formation of the solar wind (6 November 2018)
An observational technique first proposed more than four decades ago to measure the physical parameters of the corona that determine the formation of the solar wind, the source of disturbances in Earth's upper atmosphere, will be demonstrated for the first time next year. These parameters are the density, temperature, and speed of electrons in the corona.
The heliophysicists plan to demonstrate BITSE, short for the Balloon-borne Investigation of Temperature and Speed of Electrons in the corona, aboard a high-altitude scientific balloon from New Mexico, next fall. (NASA Goddard)

SUPERNOVA

Newly discovered supernova complicates origin story theories (30 November 2018)
Type Ia supernovae are fundamental to our understanding of the cosmos. Their nuclear furnaces are crucial for generating many of the elements around us, and they are used as cosmic rulers to measure distances across the universe. Despite their importance, the actual mechanism that triggers a Type Ia supernova explosion has remained elusive for decades. ASASSN-18bt was discovered by the All-Sky Automated Survey for Supernovae (ASAS-SN), an international network of telescopes headquartered at the Ohio State University that routinely scans the sky for supernovae and other cosmic explosions. NASA's Kepler space telescope was simultaneously able to take complementary data of this event. Kepler was designed to be incredibly sensitive to small changes in light for its mission of detecting extrasolar planets, so it was able to obtain especially detailed information about the explosion's genesis. The steep increase in ASASSN-18bt's early brightness could indicate that the explosion collides with another star. Other possibilities, such as an unusual distribution of radioactive material in the exploded star is a better explanation. More observations of ASASSN-18bt and more early discoveries like this one will hopefully help differentiate between different models and better understand the origins of these explosions. (Carnegie Institution for Science)

TECHNOLOGY

NASA team investigates ultrafast laser machining for multiple spaceflight applications (1 November 2018)
An ultrafast laser that fires pulses of light just 100 millionths of a nanosecond in duration could potentially revolutionize the way that NASA technicians manufacture and ultimately assemble instrument components made of dissimilar materials. A team of optical physicists at NASA's Goddard Space Flight Center in Greenbelt, Maryland, is experimenting with a femtosecond laser and has already shown that it can effectively weld glass to copper, glass to glass, and drill hair-sized pinholes in different materials. Now the group is expanding its research into more exotic glass, such as sapphire and Zerodur, and metals, such as titanium, Invar, Kovar, and aluminum, materials often used in spaceflight instruments. The goal is to weld larger pieces of these materials and show that the laser technology is effective at adhering windows onto laser housings and optics to metal mounts, among other applications. (NASA Goddard)

Hot fire test proves 3D-printed thrust chamber for future Vega Evolution
(14 November 2018)
The first element of Europe's future evolution of the Vega launch vehicle for use beyond 2025 was successfully tested this week. This hot firing proves a 3D-printed subscale thrust chamber that is fed by liquid oxygen–methane propellants. 3D-printing builds a solid object from a series of layers, each one printed on top of the last – also known as additive layer manufacturing. It speeds up the production rate, reduces the number of parts and hence the recurring costs. The evolution of Vega into a family of configurations based on common building blocks and new manufacturing technologies is set to increase flexibility and reduce launch service cost. The main element of this evolution is a new European cryogenic upper stage powered by a 10 t-class liquid oxygen–methane expander cycle engine, the M10, specifically designed for Vega, reducing its operational cost. Liquid oxygen–methane offers major advantages in terms of propellant storage during long ballistic phases required to reach orbit, it increases performance and reduces launch service costs too, as these propellants are non-toxic and safe to handle. The M10 Vega engine can be re-started and the thrust profile can be throttled to match mission requirements, opening up more launch opportunities. (ESA)

Zero G Kitchen prepares to launch its first appliance to space (15 November 2018)
Zero G Kitchen LLC announced today the specifications and timing of the first appliance of its planned 'kitchen in space,' an open platform for food development in space and the zero-gravity environment. The first appliance is an oven designed to freshly prepare small food items, such as rolls, cookies, patties, pockets and other basic foods for longer duration space travel. The oven is built in partnership with NanoRacks, the leading commercial company operating on the International Space Station. NanoRacks is known for its rapid prototyping, plug-and-play interfaces and managing the NASA payload manifesting and safety processes. (NanoRacks)

Space Tango unveils ST-42 for scalable manufacturing in space for earth-based applications
(15 November 2018)
Space Tango, a leader in the commercialization of space through R&D, bioengineering and manufacturing in microgravity, today announced ST-42, a fully autonomous robotic orbital platform designed specifically for scalable manufacturing in space. Launching in the mid 2020's, ST-42 aims to harness the unique environment of microgravity to produce high value products across industries; from patient therapeutics to advanced technology products that have the potential to revolutionize industries here on Earth. (Space Tango)

NASA to launch new refuelling mission, helping spacecraft live longer and journey farther
(20 November 2018)
NASA will lay the foundation for spacecraft life extension and long duration space exploration with the upcoming launch of Robotic Refueling Mission 3 (RRM3), a mission that will pioneer techniques for storing and replenishing cryogenic spacecraft fuel. The third phase of an ongoing technology demonstration, RRM3 will attach to the International Space Station and build on two previous missions, RRM and RRM2. These first two phases practised the robotic tasks of removing caps and valves on spacecraft, leading up to the act of replenishing fuel, but stopped short of cryogenic fluid transfer. (NASA Goddard)

ESA team blasts Intel's new AI chip with radiation at CERN (29 November 2018)
An ESA-led team subjected Intel's new Myriad 2 artificial intelligence chip to one of the most energetic radiation beams available on Earth. This test of its suitability to fly in space took place at CERN, the European Organization for Nuclear Research. The AI chip is related

in turn to an ESA-fostered family of integrated circuits. The Myriad 2 harnesses artificial intelligence for high-performance, low-power vision processing. It can be pre-trained with data to recognise particular features and patterns or perform in-depth 3D sensing. (ESA)

TELESCOPES

Harris Corporation delivering its largest mirror ever for ground-based telescope
(26 November 2018)
Harris Corporation has shipped its largest mirror ever for a ground-based observatory that will produce the deepest, widest, views of the universe. Harris is part of the National Science Foundation team assembling the Large Synoptic Survey Telescope (LSST) on the Cerro Pachón ridge in Chile. The company is providing the 3.5 meter, 3,500-pound secondary mirror and associated ground support equipment. In addition, Harris is delivering the cell assembly that stabilizes the mirror to offset the effects of gravity during operation. LSST will conduct an unprecedented, decade-long survey of the entire visible sky, detecting billions of new objects and contributing to the study of dark matter and dark energy. Operations are scheduled to begin in 2022. (Harris Corporation)

Pat Williams November 2018