

# Space News Update – April 2016

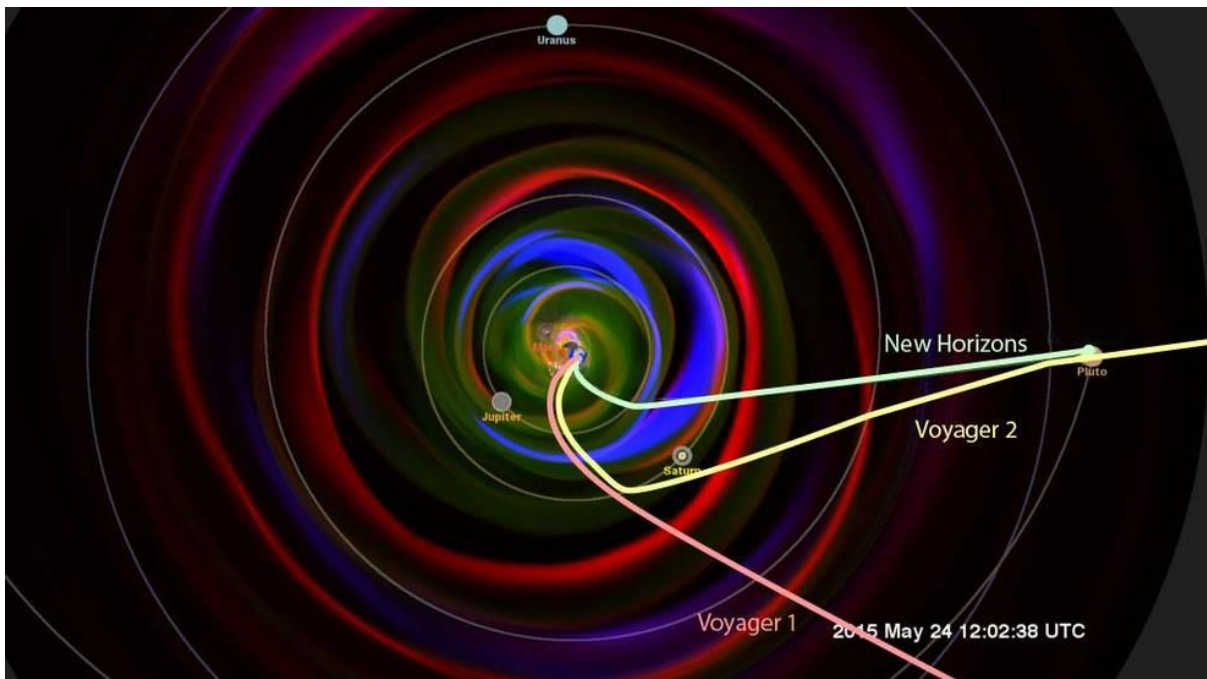
*By Pat Williams*

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- Fermi telescope poised to pin down gravitational wave sources.
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*Disclaimer - I claim no authorship for the printed material; except where noted (PW).*

## NEW HORIZONS FILLS GAP IN SPACE ENVIRONMENT OBSERVATIONS



***Space environment data collected by New Horizons over a billion miles of its journey to Pluto will play a key role in testing and improving models of the space environment throughout the solar system. This visualization is one example of such a model: It shows the simulated space environment out to Pluto a few months before New Horizons' closest approach. Drawn over the model is the path of New Horizons up to 2015, as well as the current direction of the two Voyager spacecraft – which are currently at three or four times New Horizons' distance from the sun. The solar wind that New Horizons encountered will reach the Voyager spacecraft about a year later. Credits: NASA's Goddard Space Flight Center Scientific Visualization Studio, the Space Weather Research Center (SWRC) and the Community-Coordinated Modeling Center (CCMC), Enlil and Dusan Odstrcil (GMU)***

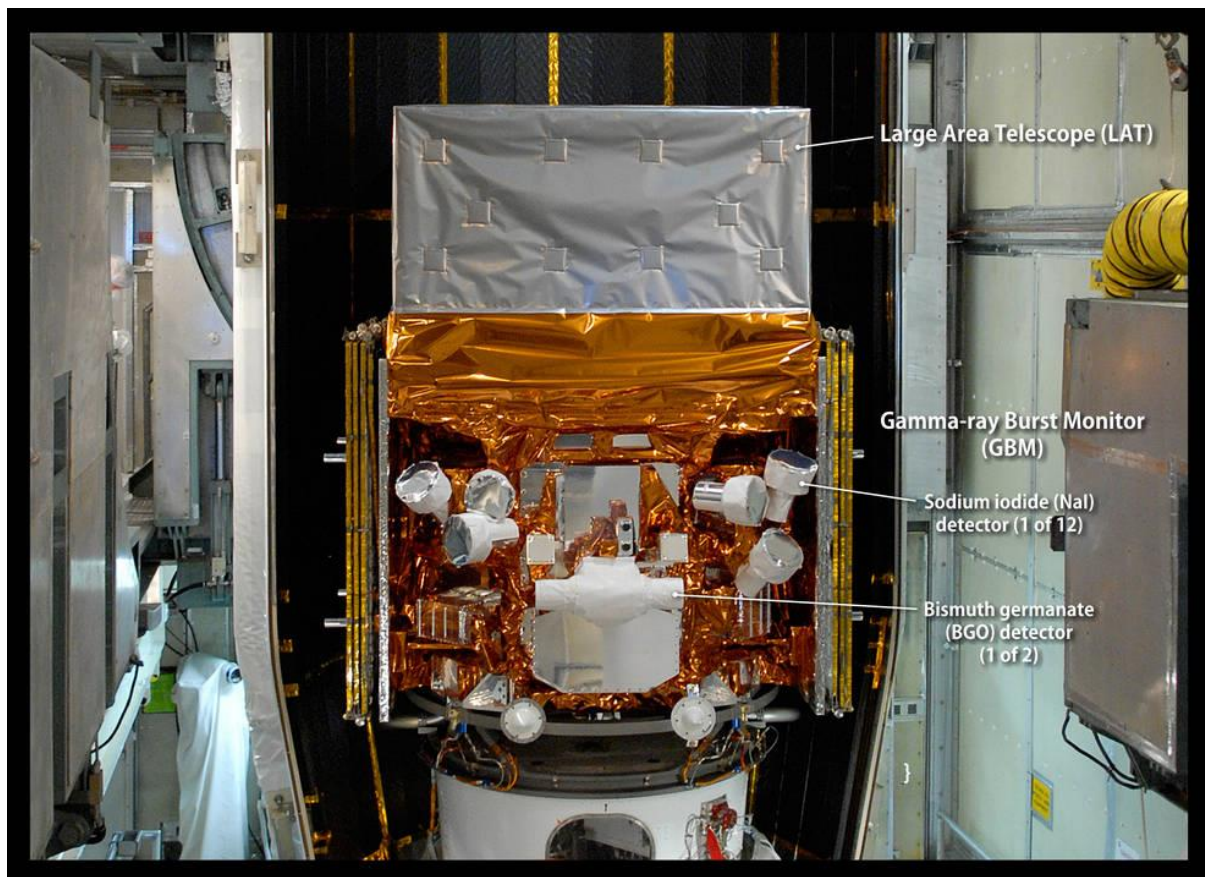
When NASA's New Horizons sped past Pluto on July 14, 2015, it took the best-ever pictures of the rocky world's surface, giving us new insight into its geology, composition and atmosphere. It also sent

back over three years' worth of measurements of the solar wind – the constant flow of solar particles that the sun flings out into space – from a region that has been visited by only a few spacecraft.

This unprecedented set of observations give us a peek into an almost entirely unexplored part of our space environment – filling a crucial gap between what other missions see closer to the sun and what the Voyager spacecraft see further out. Not only does the New Horizons data provide new glimpses of the space environment of the outer solar system, but this information helps round out our growing picture of the sun's influence on space, from near-Earth effects to the boundary where the solar wind meets interstellar space. The new data shows particles in the solar wind that have picked up an initial burst of energy, an acceleration boost that kicks them up just past their original speed. These particles may be the seeds of extremely energetic particles called anomalous cosmic rays. When these super-fast, energetic rays travel closer to Earth, they can pose a radiation hazard to astronauts. Further away, at lower energies, the rays are thought to play a role at shaping the boundary where the solar wind hits interstellar space – the region of our solar system that Voyager 2 is currently navigating and observing.

[New Horizons fills gap in space environment observations](#) (4 April 2016)

## **FERMI TELESCOPE POISED TO PIN DOWN GRAVITATIONAL WAVE SOURCES**

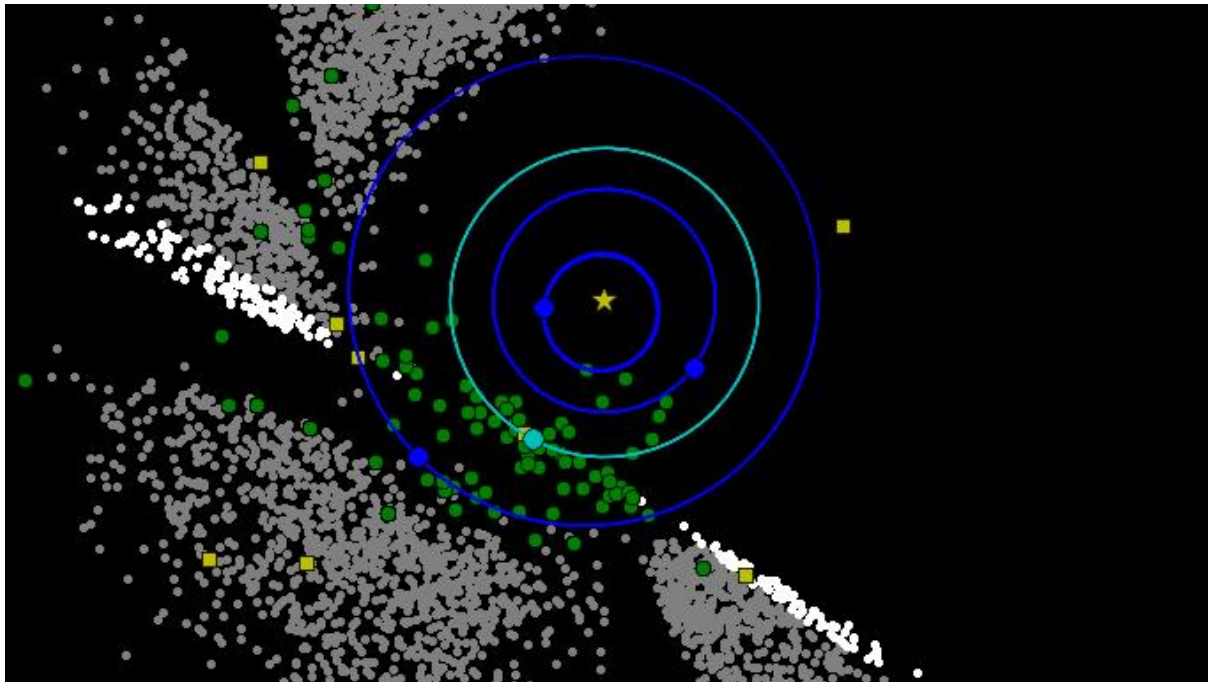


On Sept. 14, waves of energy traveling for more than a billion years gently rattled space-time in the vicinity of Earth. The disturbance, produced by a pair of merging black holes, was [captured](#) by the [Laser Interferometer Gravitational-Wave Observatory \(LIGO\)](#) facilities in Hanford, Washington, and Livingston, Louisiana. This event marked the first-ever detection of gravitational waves and opens a new scientific window on how the universe works.

Less than half a second later, the Gamma-ray Burst Monitor (GBM) on NASA's Fermi Gamma-ray Space Telescope picked up a brief, weak burst of high-energy light consistent with the same part of

the sky. Analysis of this burst suggests just a 0.2-percent chance of simply being random coincidence. Gamma-rays arising from a black hole merger would be a landmark finding because black holes are expected to merge “cleanly,” without producing any sort of light.  
[Fermi telescope poised to pin down gravitational wave sources](#) (18 April 2016)

## **ASTEROID-HUNTING SPACECRAFT DELIVERS A SECOND YEAR OF DATA**



*This graphic shows asteroids and comets observed by NASA's Near-Earth Object Wide-field Survey Explorer (NEOWISE) mission. Image credit: NASA/JPL-Caltech/UCLA/JHU*

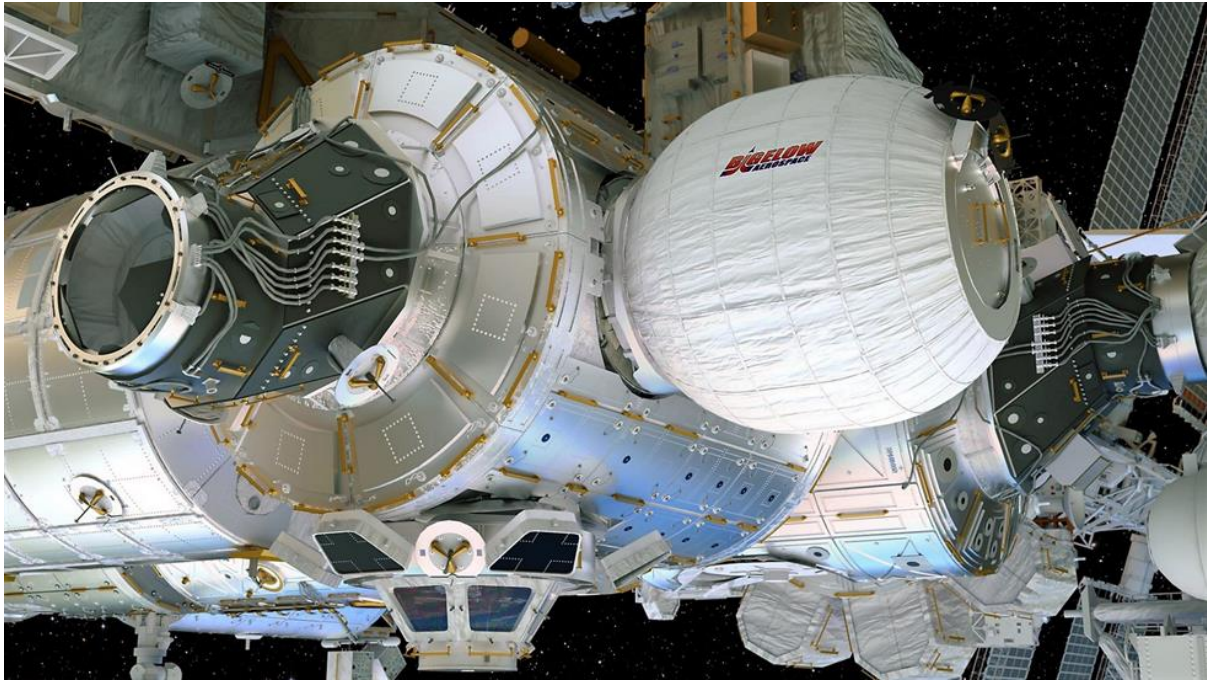
NASA's Near-Earth Object Wide-field Survey Explorer (NEOWISE) mission has released its second year of survey data. The spacecraft has now characterized a total of 439 NEOs since the mission was re-started in December 2013. Of these, 72 were new discoveries.

Near-Earth Objects (NEOs) are comets and asteroids that have been nudged by the gravitational attraction of the giant planets in our solar system into orbits that allow them to enter Earth's neighbourhood. Eight of the objects discovered in the past year have been classified as potentially hazardous asteroids (PHAs), based on their size and how closely their orbits approach Earth.

Since beginning its survey in December 2013, NEOWISE has measured more than 19,000 asteroids and comets at infrared wavelengths. More than 5.1 million infrared images of the sky were collected in the last year. By studying the distribution of lighter- and darker-coloured material, NEOWISE data give us a better understanding of the origins of the NEOs, originating from either different parts of the main asteroid belt between Mars and Jupiter or the icier comet populations. NEOWISE also is characterizing previously known asteroids and comets to provide information about their sizes and compositions.

[Asteroid-hunting spacecraft delivers a second year of data](#) (5 April 2016)

## **NASA TO ATTACH AND TEST FIRST EXPANDABLE HABITAT ON INTERNATIONAL SPACE STATION**



*This artist's concept depicts the Bigelow Expandable Activity Module attached to the International Space Station's Tranquility module. Image Credit: Bigelow Aerospace*

The first human-rated expandable structure that may help inform the design of deep space habitats is set to be installed to the International Space Station. Astronauts will first enter the habitat about a week after expansion and, during a two-year test mission, will return to the module for a few hours several times a year to retrieve sensor data and assess conditions.

Expandable habitats are designed to take up less room on a rocket, but provide greater volume for living and working in space once expanded. This first test of an expandable module will allow investigators to gauge how well the habitat performs overall and, specifically, how well it protects against solar radiation, space debris and the temperature extremes of space. Once the test period is over, BEAM will be released from the space station and will burn up during its descent through Earth's atmosphere.

[NASA to attach and test first expandable habitat on International Space Station](#) (12 April 2016)

## **MICE FLOWN IN SPACE SHOW NASCENT LIVER DAMAGE**

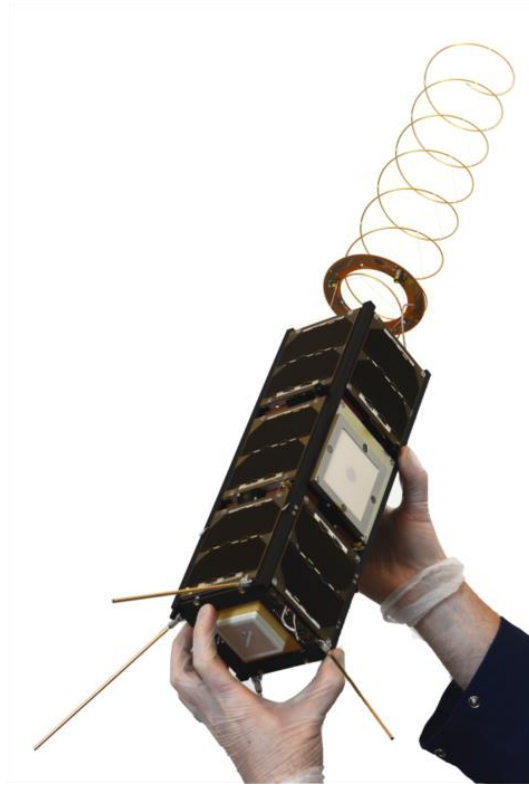
In a discovery with implications for long-term spaceflight and future missions to Mars, a researcher at the University of Colorado Anschutz Medical Campus has found that mice flown aboard the space shuttle Atlantis returned to Earth with early signs of liver disease. Spaceflight resulted in increased fat storage in the liver, comparing pair-fed mice on Earth to those on the shuttle. This was accompanied by a loss of retinol, an animal form of Vitamin A, and changes to levels of genes responsible for breaking down fats. As a result, mice showed signs of nonalcoholic fatty liver disease (NAFLD) and potential early indicators for the beginnings of fibrosis, which can be one of the more progressive consequences of NAFLD. It generally takes a long time, months to years, to induce fibrosis in mice, even when eating an unhealthy diet. If a mouse is showing nascent signs of fibrosis without a change in diet after 13 ½ days, what is happening to the humans?

With NASA planning longer deep space missions, including one to Mars which would take at least a year, these findings are significant. The stress of spaceflight and reentry to Earth might have also

played a role in the liver damage.

[Mice flown in space show nascent liver damage](#) (20 April 2016)

### **TINY CUBESAT TRACKS WORLDWIDE AIR TRAFFIC**



*GomX-3 Credit: ESA*

Since its launch six months ago, a satellite small enough to fit in an airline passenger's carry-on bag has been tracking aircraft in flight across the entire globe. The GomX-3 CubeSat was ejected from the International Space Station on 5 October 2015. GomX-3's distinctive helical antenna has detected millions of signals from aircraft, building a detailed map of global aviation traffic. These signals are regularly broadcast from aircraft, giving flight information such as speed, position and altitude. All aircraft entering European airspace are envisaged to provide such [automatic surveillance](#) in the coming years.

[Tiny CubeSat tracks worldwide air traffic](#) (7 April 2016)

### **LINKS TO OTHER SPACE AND ASTRONOMY NEWS PUBLISHED IN APRIL 2016**

#### **AEROSPACE MEDICINE RESEARCH**

[How do blood vessel cells behave in space?](#)

(8 April 2016) On 8 April 2016, at 22:43 CEST, the German SPHEROIDS experiment was launched to the ISS in a Dragon capsule on board a Falcon 9 rocket of the US aerospace company SpaceX.

[Spaceflight muscle loss study aims to benefit patients on Earth](#) (20 April 2016)

"Exercise and eat right" is a common prescription for maintaining muscle and building bone, but more advanced solutions are needed to address serious diseases that lead to loss of muscle function in the general population.

[Gene analysis system could accelerate pace of research on the Space Station](#) (21 April 2016)

Biologists around the world routinely perform gene expression analysis to better understand living systems. Gene expression analysis examines the types and amounts of molecules produced by genes in living cells, telling us which genes are active and which are inactive at a given point in time.

## **ASTEROIDS**

[SwRI's BORE microgravity payload flies aboard commercial suborbital spaceflight](#) (4 April 2016)

A Southwest Research Institute (SwRI) experiment designed to assess the surface properties and processes of near-Earth asteroids successfully flew aboard Blue Origin's New Shepard space vehicle April 2.

## **ASTROPHYSICS**

[Fast radio burst "afterglow" was actually a flickering black hole](#) (4 April 2016)

Last February a team of astronomers reported detecting an afterglow from a mysterious event called a fast radio burst, which would pinpoint the precise position of the burst's origin, a longstanding goal in studies of these mysterious events.

[Supernovae showered Earth with radioactive debris](#)

(6 April 2016) An international team of scientists has found evidence of a series of massive supernova explosions near our solar system, which showered the Earth with radioactive debris.

[Dark matter does not contain certain axion-like particles](#) (22 April 2016)

Physicists are still struggling with the conundrum of identifying more than 80 percent of the matter in the Universe.

[Light echoes give clues to protoplanetary disk](#) (26 April 2016)

"Understanding protoplanetary disks can help us understand some of the mysteries about exoplanets, the planets in solar systems outside our own," said Huan Meng, postdoctoral research associate at the University of Arizona, Tucson.

[Fermi telescope helps link cosmic neutrino to blazar blast](#) (28 April 2016)

Nearly 10 billion years ago, the black hole at the centre of a galaxy known as PKS B1424-418 produced a powerful outburst. Light from this blast began arriving at Earth in 2012

## **BLACK HOLES**

[Supermassive black holes do not form from stellar black holes](#) (6 April 2016)

Often containing more than a billion times the mass than our Sun, supermassive black holes have perplexed humans for decades.

[Behemoth black hole found in an unlikely place](#) (6 April 2016)

Astronomers have uncovered a near-record-breaking supermassive black hole, weighing 17 billion suns, in an unlikely place: in the centre of a galaxy in a sparsely populated area of the universe.

[Mysterious alignment of black holes](#) (12 April 2016)

Deep radio imaging by researchers in the University of Cape Town and University of the Western Cape, in South Africa, has revealed that supermassive black holes in a region of the distant universe are all spinning out radio jets in the same direction – most likely a result of primordial mass fluctuations in the early universe.

## **BROWN DWARFS**

[Missing brown dwarfs](#) (8 April 2016)

When re-analysing catalogued and updated observational data of brown dwarfs in the solar

neighbourhood, astronomers from Potsdam have found that a significant number of nearby brown dwarfs should still be out there, awaiting their discovery.

[Lone planetary-mass object found in family of stars](#) (19 April 2016)

In 2011, astronomers announced that our galaxy is likely teeming with free-floating planets. In fact, these lonely worlds, which sit quietly in the darkness of space without any companion planets or even a host sun, might outnumber stars in our Milky Way galaxy.

## COMET

[Colour-changing comet](#) (7 April 2016)

Rosetta's comet has been seen changing colour and brightness in front of the ESA orbiter's eyes, as the Sun's heat strips away the older surface to reveal fresher material.

[Clathrate ices in comet 67P](#) (8 April 2016)

For decades, scientists have agreed that comets are mostly water ice, but what kind of ice — amorphous or crystalline — is still up for debate.

[Unique fragment from Earth's formation returns after billions of years in cold storage](#) (29 April 2016)

Astronomers have found a unique object that appears to be made of inner Solar System material from the time of Earth's formation, which has been preserved in the Oort Cloud far from the Sun for billions of years.

## COSMIC RAYS

[Microscopic "timers" reveal likely source of galactic space radiation](#) (21 April 2016)

Most of the cosmic rays that we detect at Earth originated relatively recently in nearby clusters of massive stars, according to new results from NASA's Advanced Composition Explorer (ACE) spacecraft.

## DWARF PLANETS AND MOONS

[Hubble discovers moon orbiting the dwarf planet Makemake](#) (26 April 2016)

Peering to the outskirts of our solar system, NASA's Hubble Space Telescope has spotted a small, dark moon orbiting Makemake, the second brightest icy dwarf planet — after Pluto — in the Kuiper Belt.

## EARTH

[Sending crude oil into space to study Earth's depths](#) (5 April 2016)

Containers of highly pressurised crude oil will be launched into space from China next week to help improve our knowledge of oil reservoirs buried kilometres underground.

[Sentinel-3A feels the heat](#) (6 April 2016)

Despite only being in orbit a matter of weeks, Sentinel-3A has already delivered some impressive first images.

[NASA network transports satellite data to Earth](#) (11 April 2016)

Based out of NASA's Goddard Space Flight Center in Greenbelt, Maryland, the Near Earth Network (NEN) serves as a conduit for information from spacecraft in low-Earth orbits, geosynchronous orbits, and even lunar orbits to the scientists who will study and use it on the ground.

[World's toughest mountain biking race chooses SPOT Gen3 satellite trackers to safeguard 400 competitors](#) (21 April 2016)

SPOT today announced that the organisers of this year's Titan Desert, the toughest mountain bike race in the world, have chosen to deploy SPOT Gen3 satellite trackers to enhance the safety of the 400 race competitors.

[Sentinel-1B delivers](#) (28 April 2016)

Launched on 25 April from Europe's Spaceport in French Guiana, Sentinel-1B has produced its first images only two hours after the radar was switched on – a record time for a space radar.

## EXOPLANETS

['Topsy turvy' ocean circulation on distant planets](#) (4 April 2016)

The salt levels of oceans on distant Earth-like planets could have a major effect on their climates – according to new research from the Centre for Ocean and Atmospheric Sciences at the University of East Anglia.

[Young, unattached Jupiter analogue found in solar neighbourhood](#) (6 April 2016)

A team of astronomers from Carnegie and Western University in Ontario, Canada, has discovered one of the youngest and brightest free-floating, planet-like objects within relatively close proximity to the Sun.

[Hot super-Earths stripped by host stars](#) (11 April 2016)

Astrophysicists at the University of Birmingham have used data from the NASA Kepler space telescope to discover a class of extrasolar planets whose atmospheres have been stripped away by their host stars, according to research published in the journal Nature Communications today.

[Kepler remains stable as health check continues](#) (15 April 2016)

The Kepler spacecraft remains stable as the process of returning it to science continues.

[Kepler recovered and returned to the K2 mission](#) (22 April 2016)

The Kepler spacecraft has been recovered and, as of 8:30 a.m. PDT today, it is back on the job as the K2 mission searching for exoplanets—planets beyond our solar system.

## GALAXIES

[Cosmic beacons reveal the Milky Way's ancient core](#) (22 April 2016)

An international team of astronomers led by Dr. Andrea Kunder of the Leibniz Institute for Astrophysics Potsdam (AIP) in Germany and Dr. R. Michael Rich of UCLA has discovered that the central 2000 light years within the Milky Way Galaxy hosts an ancient population of stars.

## GAMMA-RAYS

[HAWC Gamma-ray Observatory reveals new look at the very-high-energy sky](#)

(18 April 2016) The United States and Mexico constructed the High Altitude Water Cherenkov (HAWC) Gamma-ray Observatory to observe some of the most energetic phenomena in the known universe—the aftermath when massive stars die, glowing clouds of electrons around rapidly spinning neutron stars, and supermassive black holes devouring matter and spitting out powerful jets of particles.

## INTERNATIONAL SPACE STATION

[NASA cargo headed to space station includes habitat prototype, medical research](#) (8 April 2016)

Tucked in the trunk of the latest commercial cargo spacecraft to head for the International Space Station is an expandable structure that has the potential to revolutionize work and life on the space station.

## INTERSTELLAR

[Interstellar dust intercepted at Saturn](#) (14 April 2016)

The international Cassini spacecraft has detected the faint but distinct signature of dust coming from outside our Solar System.



## **JAMES WEBB SPACE TELESCOPE**

[James Webb Space Telescope's golden mirror unveiled](#) (27 April 2016)

NASA engineers recently unveiled the giant golden mirror of NASA's James Webb Space Telescope as part of the integration and testing of the infrared telescope.

## **JUPITER AND MOONS**

[Europa's heaving ice might make more heat than scientists thought](#) (14 April 2016)

Jupiter's moon Europa is under a constant gravitational assault. As it orbits, Europa's icy surface heaves and falls with the pull of Jupiter's gravity, creating enough heat, scientists think, to support a global ocean beneath the moon's solid shell.

## **MARS**

[Mars' surface revealed in unprecedented detail](#) (26 April 2016)

The surface of Mars – including the location of Beagle-2 – has been shown in unprecedented detail by UCL scientists using a revolutionary image stacking and matching technique.

[Curiosity Mars Rover crosses rugged plateau](#) (27 April 2016)

NASA's Curiosity Mars rover has nearly finished crossing a stretch of the most rugged and difficult-to-navigate terrain encountered during the mission's 44 months on Mars.

## **MISCELLANEOUS**

[X-ray astronomy satellite ASTRO-H \(Hitomi\) declared lost](#) (28 April 2016)

The Japan Aerospace Exploration Agency (JAXA) established emergency headquarters led by President Okumura and has been doing its utmost to understand the anomaly of the X-ray Astronomy Satellite ASTRO-H (Hitomi).

## **MOON**

[Moon Express initiates commercial lunar mission approval process with the U.S. Government](#)

(8 April 2016)

Today, Moon Express made history as the first private space company to request the U.S government to conduct a payload review of its spacecraft and plans leading to regulatory approval of a commercial mission to the Moon in 2017.

## **SATURN AND MOONS**

[Profile of a methane sea on Titan](#) (26 April 2016)

Saturn's largest moon is covered in seas and lakes of liquid hydrocarbons – and one sea has now been found to be filled with pure methane, with a seabed covered by a sludge of organic-rich material, and possibly surrounded by wetlands.

## **STARS AND STAR CLUSTERS**

[Triple star system with 'hot Jupiter'](#) (7 April 2016)

Crisp, clear images of a "hot Jupiter" system captured by a University of Notre Dame physicist were vital in determining that a newly found planet inhabits a three-star system, a phenomenon documented only a few times before.

[Nearby massive star explosion 30 million years ago equalled detonation of 100 million suns](#)

(26 April 2016)

A giant star that exploded 30 million years ago in a galaxy near Earth had a radius prior to going

supernova that was 200 times larger than our sun, according to astrophysicists at Southern Methodist University, Dallas.

[Powerful winds spotted from mysterious X-ray binaries](#) (28 April 2016)

ESA's XMM-Newton has discovered gas streaming away at a quarter of the speed of light from very bright X-ray binaries in two nearby galaxies.

## **SUN**

[NASA missions measure solar flare from 2 spots in space](#) (19 April 2016)

Solar flares are intense bursts of light from the sun. They are created when complicated magnetic fields suddenly and explosively rearrange themselves, converting magnetic energy into light through a process called magnetic reconnection – at least, that's the theory, because the signatures of this process are hard to detect.

[High-resolution images capture a solar flare as it unfolds](#) (22 April 2016)

Scientists at NJIT's Big Bear Solar Observatory (BBSO) have captured unprecedented images of a recent solar flare, including bright flare ribbons seen crossing a sunspot followed by "coronal rain," plasma that condenses in the cooling phase shortly after the flare, showering the visible surface of the Sun where it lands in brilliant explosions.

## **SUPERNOVA**

[Supernova iron found on the moon](#) (14 April 2016)

A dying star ends its life in a cataclysmic explosion, shooting the majority of the star's material, primarily new chemical elements created during the explosion, out into space.

## **TECHNOLOGY**

[The next big thing in space is really, really small](#) (6 April 2016)

A tiny spacecraft being developed at Arizona State University is breaking the barrier of launch cost, making the price of conducting a space mission radically cheaper.

[Space weather satellite ICON on course for summer 2017 launch](#) (7 April 2016)

NASA's newest space weather research satellite, the Ionospheric Connection Explorer, is on course for a summer 2017 launch after UC Berkeley scientists and their colleagues shipped its four instruments to Utah for testing, prior to being packed into the final satellite.

[Kepler recovered from emergency and stable](#) (11 April 2016)

Mission operations engineers have successfully recovered the Kepler spacecraft from Emergency Mode (EM).

[NASA begins testing of revolutionary E-Sail technology](#) (11 April 2016)

Testing has started at NASA's Marshall Space Flight Center in Huntsville, Alabama, on a concept for a potentially revolutionary propulsion system that could send spacecraft to the edge of our solar system, the heliopause, faster than ever before.

[Heliospectra announces commercial water-cooled light first application in space](#) (14 April 2016)

Heliospectra, a world leader in intelligent lighting technology for controlled environments horticulture, is now one step closer to growing safe space station food crops.

[NASA works to improve solar electric propulsion for deep space exploration](#) (19 April 2016)

NASA has selected Aerojet Rocketdyne to design and develop an advanced electric propulsion system that will significantly advance the nation's commercial space capabilities, and enable deep space exploration missions, including the robotic portion of NASA's Asteroid Redirect Mission (ARM) and its Journey to Mars.

[Student satellites fly freely on their orbit in space](#) (26 April 2016)

For three student teams, the dream of building and working on a real space mission is coming true. At 01:50 CEST (23:50 GMT) today, a trio of student-built CubeSats were released into space as part of ESA's Education Office 'Fly Your Satellite!' programme.

[First light for the Four Laser Guide Star Facility on ESO's Very Large Telescope](#) (27 April 2016)

On 26 April 2016 ESO's Paranal Observatory in Chile hosted an event to mark the first light for the four powerful lasers that form a crucial part of the adaptive optics systems on ESO's Very Large Telescope.

## **VENUS**

[Venus Express sheds light on Venus' polar atmosphere](#) (19 April 2016)

Some of the final results sent back by ESA's Venus Express before it plummeted down through the planet's atmosphere have revealed it to be rippling with atmospheric waves – and, at an average temperature of  $-157^{\circ}\text{C}$ , colder than anywhere on Earth.

*Pat Williams. April 2016*