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Astronomy & Physics Weekly News

Dept. of Applied Physics & Astronomy - University of Sharjah
Compiled by **Dr. Ilias Fernini**

مركز الشارقة لعلوم الفضاء والفلك
Sharjah Center for Astronomy & Space Sciences

Top News

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The state of the early universe: The beginning was fluid

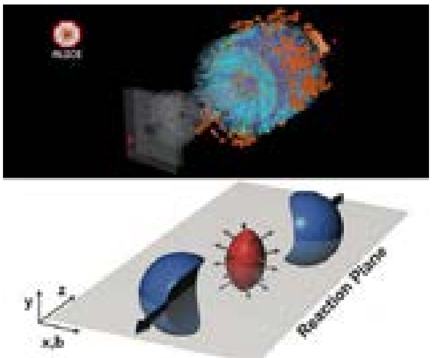


Fig. 1 [top] An event from the first Xenon-Xenon collision at the Large Hadron Collider at the top energy of the Large Hadron Collider (5.44 TeV) registered by ALICE [credit: ALICE]. Every colored track (The blue lines) corresponds to the trajectory of a charged particle produced in a single collision; [lower] formation of anisotropic flow in relativistic heavy-ion collisions due to the geometry of the hot and dense overlap zone (shown in red color).

The particle physicists at the Niels Bohr Institute have obtained new results, working with the LHC, replacing the lead-ions, usually used for collisions, with Xenon-ions. Xenon is a "smaller" atom with fewer nucleons in its nucleus.

When colliding ions, the scientists create a fireball that recreates the initial conditions of the universe at temperatures in excess of several thousand billion degrees. In contrast to the Universe, the lifetime of the droplets of QGP produced in the laboratory is ultra short, a fraction of a second (In technical terms, only about 10-22 seconds).

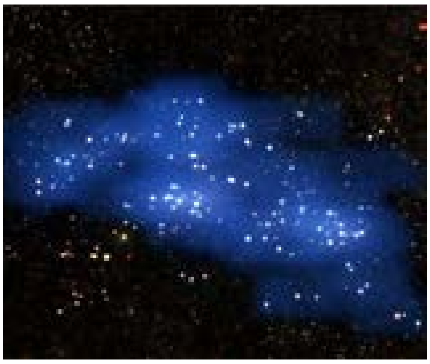
Under these conditions the density of quarks and gluons is very large and a special state of matter is formed in which quarks and gluons are quasi-free (dubbed the strongly interacting QGP). The experiments reveal that the primordial matter, the instant before atoms formed, behaves like a liquid that can be described in terms of hydrodynamics.

How to approach "the moment of creation"
"One of the challenges we are facing is that, in heavy ion collisions, only the information of the final state of the many particles which are detected by the experiments are directly available - but we want to know what happened in the beginning of the collision and first few moments afterwards", You Zhou, Postdoc in the research group Experimental Subatomic Physics at the Niels Bohr Institute, explains.

"We have developed new and powerful tools to investigate the properties of the small droplet of QGP (early universe) that we create in the experiments".

They rely on studying the spatial distribution of the many thousands of particles that emerge from the collisions when the quarks and gluons have been trapped into the particles that the Universe consists of today. This reflects not only the initial geometry of the collision, but is sensitive to the properties of the QGP. It can be ...Read More...

Largest galaxy proto-supercluster found



An international team of astronomers using the VIMOS instrument of ESO's Very Large Telescope have uncovered a colossal structure in the early Universe. This galaxy proto-supercluster - which they nickname Hyperion - was unveiled by new measurements and a complex examination of archive data. This is the largest and most massive structure yet found at such a remote time and distance - merely 2 billion years after the Big Bang.

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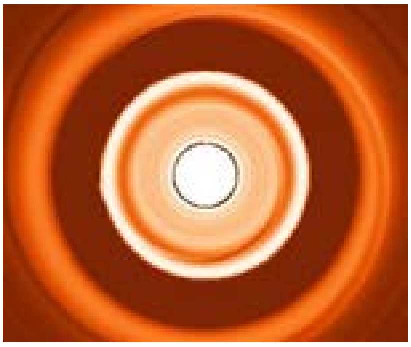
A team of astronomers, led by Olga Cucciati of Istituto Nazionale di Astrofisica Bologna, have used the VIMOS instrument on ESO's Very Large Telescope (VLT) to identify a gigantic proto-supercluster of galaxies forming in the early Universe, just 2.3 billion years after the Big Bang.

This structure, which the researchers nicknamed Hyperion, is the largest and most massive structure to be found so early in the formation of the Universe [1]. The enormous mass of the proto-supercluster is calculated to be more than one million billion times that of the Sun. This colossal mass is similar to that of the largest structures observed in the Universe today, but finding such a massive object in the early Universe surprised astronomers.

"This is the first time that such a large structure has been identified at such a high redshift, just over 2 billion years after the Big Bang," explained the first author of the discovery paper, Olga Cucciati [2]. "Normally these kinds of structures are known at lower redshifts, which means when the Universe has had much more time to evolve and construct such huge things. It was a surprise to see something this evolved when the Universe was relatively young!"

Located in the COSMOS field in the constellation of Sextans (The Sextant), Hyperion was identified by analysing the vast amount of data obtained from the VIMOS Ultra-deep Survey led by Olivier Le Fevre (Aix-Marseille Universite, CNRS, CNES). The VIMOS Ultra-Deep Survey provides an unprecedented 3D map of the distribution of over 10 000 galaxies in the distant Universe. ...Read More...

Double dust ring test could spot migrating planets



Dust density rendered simulation image of the disc - white circle is inner dust ring.

New research by a team led by an astrophysicist at the University of Warwick has a way of finally telling whether newly forming planets are migrating within the disc of dust and gas that typically surrounds stars or whether they are simply staying put in the same orbit around the star.

Finding real evidence that a planet is migrating (usually inwards) within such discs would help solve a number of problems that have emerged as astronomers are able to see more and more detail within protoplanetary discs. In particular it might provide a simple explanation for a range of strange patterns and disturbances that astronomers are beginning to identify within these discs.

Planet migration is a process that astronomers have known the theory about for 40 years but it's only now that they have been able to find a way of observationally testing if it really occurs. This new research from a team led by the University of Warwick, along with Cambridge, provides two new observational signatures in young solar system's dust rings that would be evidence of a migrating planet.

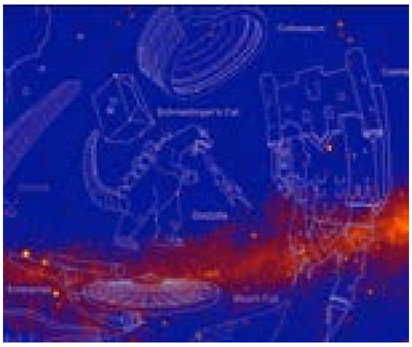
That research was published 17th of October on arXiv AT in a paper entitled "Is the ring inside or outside the planet?: The effect of planet migration on dust rings" which will be published in the Monthly Notices of the Royal Astronomical Society.

The lead author, Dr Farzana Meru of the University of Warwick's Astronomy and Astrophysics Group in the Department of Physics, on the paper said:

"Planet migration in protoplanetary discs plays an important role in the longer term evolution of planetary systems, yet we currently have no direct observational test to determine if a planet is migrating in its gaseous disc.

"However the technology now available to us in the Atacama Large Millimeter/submillimeter Array (ALMA), is able to look deep into these discs, and even see detailed structures within the discs such as rings, gaps, spiral arms, crescents and clumps. ALMA can also use different millimetre frequencies to seek out concentrations of different particle sizes so we can also use it to explore the make up of individual dust rings within the disc". ...Read More...

NASA's Fermi Mission Energizes the Sky With Gamma-ray Constellations



New, unofficial constellations appear in this image of the sky mapped by NASA's Fermi Gamma-ray Space Telescope. Fermi scientists devised the constellations to highlight the mission's 10th year of operations. Fermi has mapped about 3,000 gamma-ray sources - 10 times the number known before its launch and comparable to the number of bright stars in the traditional constellations.

Long ago, sky watchers linked the brightest stars into patterns reflecting animals, heroes, monsters and even scientific instruments into what is now an official collection of 88 constellations. Now scientists with NASA's Fermi Gamma-ray Space Telescope have devised a set of modern constellations constructed from sources in the gamma-ray sky to celebrate the mission's 10th year of operations.

The new constellations include a few characters from modern myths. Among them are the Little Prince, the time-warping TARDIS from "Doctor Who," Godzilla and his heat ray, the antimatter-powered U.S.S. Enterprise from "Star Trek: The Original Series" and the Hulk, the product of a gamma-ray experiment gone awry.

"Developing these unofficial constellations was a fun way to highlight a decade of Fermi's accomplishments," said Julie McEnery, the Fermi project scientist at NASA's Goddard Space Flight Center in Greenbelt, Maryland. "One way or another, all of the gamma-ray constellations have a tie-in to Fermi science."

Since July 2008, Fermi's Large Area Telescope (LAT) has been scanning the entire sky each day, mapping and measuring sources of gamma rays, the highest-energy light in the universe. The emission may come from pulsars, nova outbursts, the debris of supernova explosions and giant gamma-ray bubbles located in our own galaxy, or supermassive black holes and gamma-ray bursts - the most powerful explosions in the cosmos - in others.

"By 2015, the number of different sources mapped by Fermi's LAT had expanded to about 3,000 - 10 times the number known before the mission," said Goddard's Elizabeth Ferrara, who led the constellation project. "For the first time ever, the number of known gamma-ray sources was comparable to the number of bright stars, so we thought a new set of constellations was a great way to illustrate the point." ...Read More...

Researchers solve mystery at the center of the Milky Way

File illustration only

Astronomers from Lund University in Sweden have now found the explanation to a recent mystery at the centre of the Milky Way galaxy: the high levels of scandium discovered last spring near the galaxy's giant black hole were in fact an optical illusion.

Last spring, researchers published a study about the apparent presence of astonishing and dramatically high levels of three different elements in red giant stars, located less than three light years away from the big black hole at the centre of our galaxy. Various possible explanations were presented, for example that the high levels were a result of earlier stars being disrupted as they fall into the black hole, or a result of debris from the collisions of neutron stars.

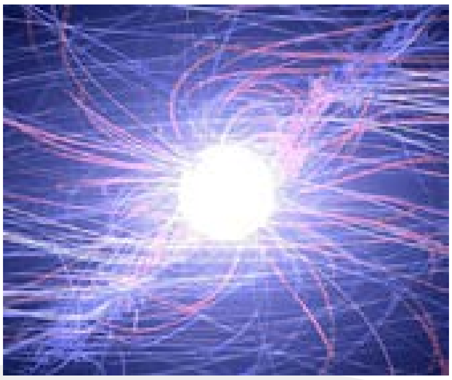
Now another group of astronomers from Lund University among others, in collaboration with UCLA in California, have found an explanation for the high levels of scandium, vanadium and yttrium. They argue that the so-called spectral lines presented last spring were actually an optical illusion. Spectral lines are used to find out which elements a star contains - by using its own light.

"These giant red stars have used up most of their hydrogen fuel and their temperatures are therefore only half of the sun's", says Brian Thorsbro, lead author of the study and doctoral student in astronomy at Lund University.

According to the new study, the lower temperatures of the giant stars helped to create the optical illusion that appeared in the measurements of spectral lines. Specifically, it means that the electrons in the elements behave differently at different temperatures, which in turn can be misleading when measuring the spectral lines of elements in different stars. The conclusion is the result of a close collaboration between astronomers and atomic physicists.

Brian Thorsbro and his colleagues have had the world's largest telescope, at the W. M. Keck Observatory on Mauna Kea, Hawaii, at their disposal, thanks to their collaboration with R. Michael Rich at UCLA. ...Read More...

"Pulsar in a Box" reveals surprising picture of neutron star's surroundings



Electrons (blue) and positrons (red) from a computer-simulated pulsar. These particles become accerlated to extreme energies in a pulsar's powerful magnetic and electric fields; lighter tracks show particles with higher energies. Each particle seen here actually represents trillions of electrons or positrons. Better knowledge of the particle environment around neutron stars will help astronomers understand how they behave like cosmic lighthouses, producing precisely timed radio and gamma-ray pulses. Credit: NASA's Goddard Space Flight Center.

An international team of scientists studying what amounts to a computer-simulated "pulsar in a box" are gaining a more detailed understanding of the complex, high-energy environment around spinning neutron stars, also called pulsars. The model traces the paths of charged particles in magnetic and electric fields near the neutron star, revealing behaviors that may help explain how pulsars emit gamma-ray and radio pulses with ultraprecise timing.

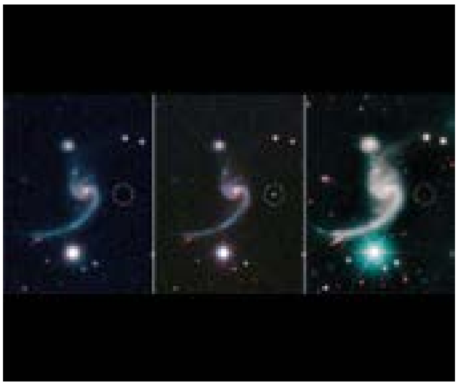
"Efforts to understand how pulsars do what they do began as soon as they were discovered in 1967, and we're still working on it," said Gabriele Brambilla, an astrophysicist at NASA's Goddard Space Flight Center in Greenbelt, Maryland, and the University of Milan who led a study of the recent simulation. "Even with the computational power available today, tracking the physics of particles in the extreme environment of a pulsar is a considerable challenge."

A pulsar is the crushed core of a massive star that ran out of fuel, collapsed under its own weight and exploded as a supernova. Gravity forces more mass than the Sun's into a ball no wider than Manhattan Island in New York City while also revving up its rotation and strengthening its magnetic field. Pulsars can spin thousands of times a second and wield the strongest magnetic fields known.

These characteristics also make pulsars powerful dynamos, with superstrong electric fields that can rip particles out of the surface and accelerate them into space.

NASA's Fermi Gamma-ray Space Telescope has detected gamma rays from 216 pulsars. Observations show that the high-energy emission occurs farther away from the neutron star than the radio pulses. But exactly where and how these signals are produced remains ...Read More...

Massive star's unusual death heralds the birth of compact neutron star binary



The three panels represent moments before, when and after the faint supernova iPTF14gqr, visible in the middle panel, appeared in the outskirts of a spiral galaxy located 920 million light years away from us. The massive star that died in the supernova left behind a neutron star in a very tight binary system. These dense stellar remnants will ultimately spiral into each other and merge in a spectacular explosion, giving off gravitational and electromagnetic waves. Image credit: SDSS/Caltech/Keck.

Carnegie's Anthony Piro was part of a Caltech-led team of astronomers who observed the peculiar death of a massive star that exploded in a surprisingly faint and rapidly fading supernova, possibly creating a compact neutron star binary system. Piro's theoretical work provided crucial context for the discovery. Their findings are published by Science.

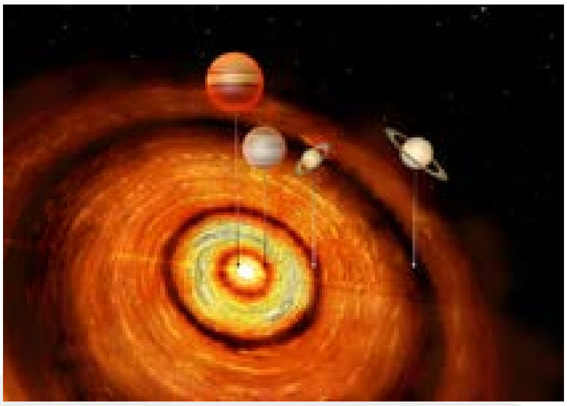
Observations made by the Caltech team - including lead author Kishalay De and project principal investigator Mansi Kasliwal (herself a former-Carnegie postdoc) - suggest that the dying star had an unseen companion, which gravitationally siphoned away most of the star's mass before it exploded as a supernova.

The explosion is believed to have resulted in a neutron star binary, suggesting that, for the first time, scientists have witnessed the birth of a binary system like the one first observed to collide by Piro and a team of Carnegie and UC Santa Cruz astronomers in August 2017.

A supernova occurs when a massive star - at least eight times the mass of the Sun - exhausts its nuclear fuel, causing the core to collapse and then rebound outward in a powerful explosion. After the star's outer layers have been blasted away, all that remains is a dense neutron star - an exotic star about the size of a city but containing more mass than the Sun.

Usually, a lot of material - many times the mass of the Sun - is observed to be blasted away in a supernova. However, the event that Kasliwal and her colleagues observed, dubbed iPTF 14gqr, ejected matter only one fifth of the Sun's mass. "We saw this massive star's core collapse, but we saw remarkably little mass ejected," Kasliwal says. ..Read More...

Huge alien planets detected around baby star for first time ever



Researchers have identified a young star, CI Tau, with four Jupiter- and Saturn-sized planets in orbit around it.Amanda Smith / Institute of Astronomy

In a discovery that raises questions about long-held ideas about how planets form, astronomers have detected several enormous planets in orbit around a young star — in this case CI Tau, a 2-million-year-old star about 500 light-years away in the constellation Taurus.

This is the first time multiple gas giant planets have been observed orbiting a "toddler" star. Our Milky Way galaxy is filled with stars that have been around for billions of years; our sun is about 4.5 billion years old.

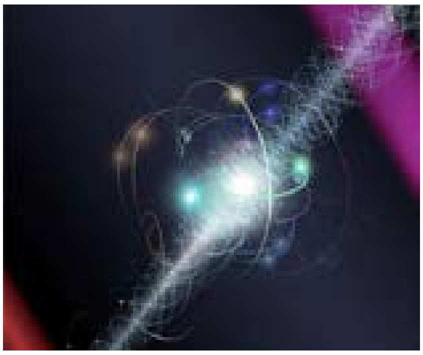
It's also the first time such extreme variation has been observed in the orbits of planets within a star system. The astronomers found that the outermost of CI Tau's known planets orbits at a distance 1,000 times greater than the orbit of its innermost planet, which is designated a "hot Jupiter" because of its size and its tight orbit around its host star.

CI Tau's hot Jupiter, known as CI Tau b, was first observed in 2016 with help from the ALMA radio telescope in Chile. But when the international team of astronomers used ALMA to take a fresh look at CI Tau in the fall of 2017, they detected three gaps in the star's protoplanetary disk — the vast swirling cloud of ice and dust that surrounds it. The gaps are considered strong evidence of the presence of three additional gas giant planets around CI Tau.

The discovery led the astronomers to question existing ideas about how long it takes large planets to form.

"This is telling us that giant planets must form rapidly in the protoplanetary disk — which is in contrast to the most common model for planet formation, which involves a slow growth of a solid core followed by gas accreting onto it to form a gas giant planet," Farzana Meru, an astrophysicist at the University of Warwick in England and a co-author of a paper about the research, told NBC News MACH in an email. ...Read More...

New study sets a size limit for undiscovered subatomic particles



In this artist's representation, an electron travels between two lasers in an experiment. The electron is spinning about its axis as a cloud of other subatomic particles are constantly emitted and reabsorbed. Some theories in particle physics predict particles, as yet undetected, that would cause the cloud to appear very slightly pear shaped when seen from a distance. With the support of the National Science Foundation, ACME researchers created an experiment setup look at that shape with extreme precision. To the limits of their experiment, they saw a perfectly round sphere, implying that certain types of new particles, if they exist at all, have properties different from those theorists expected.

A new study suggests that many theorized heavy particles, if they exist at all, do not have the properties needed to explain the predominance of matter over antimatter in the universe.

If confirmed, the findings would force significant revisions to several prominent theories posed as alternatives to the Standard Model of particle physics, which was developed in the early 1970s. Researchers from Yale, Harvard, and Northwestern University conducted the study, which was published Oct. 17 in the journal Nature.

The discovery is a window into the mind-bending nature of particles, energy, and forces at infinitesimal scales, specifically in the quantum realm, where even a perfect vacuum is not truly empty. Whether that emptiness is located between stars or between molecules, numerous experiments have shown that any vacuum is filled with every type of subatomic particle - and their antimatter counterparts - constantly popping in and out of existence.

One approach to identifying them is to take a closer look at the shape of electrons, which are surrounded by subatomic particles. Researchers examine tiny distortions in the vacuum around electrons as a way to characterize the particles.

The new study reports work done with the Advanced Cold Molecule Electron Dipole Moment (ACME) experiment, a collaborative effort to detect the electric dipole moment (EDM) of the electron. An electron EDM corresponds to a small bulge on one end of the electron, and a dent on the opposite end.

The Standard Model predicts an extremely small electron EDM, but there are a number of cosmological questions - such as the preponderance of matter over ...Read More...

Physics: Not everything is where it seems to be

The spiral wavefront of the elliptically polarized light hits the lens at a slight angle, leading to the impression that the source of the light is somewhat off its actual position.

With modern optical imaging techniques, the position of objects can be measured with a precision that reaches a few nanometers. These techniques are used in the laboratory, for example, to determine the position of atoms in quantum experiments.

"We want to know the position of our quantum bits very precisely so that we can manipulate and measure them with laser beams," explains Gabriel Araneda from the Department of Experimental Physics at the University of Innsbruck.

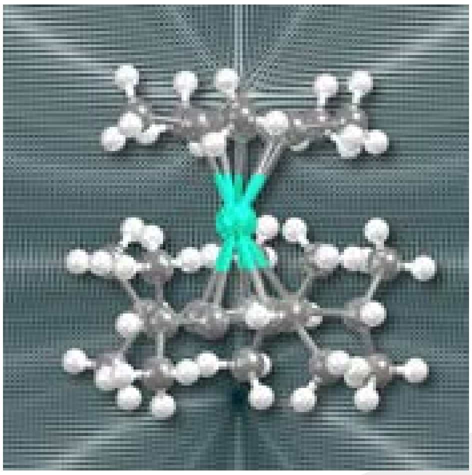
A collaborative work between physicists at TU Wien, Vienna, led by Arno Rauschenbeutel (now an Alexander von Humboldt Professor at Humboldt-Universitat zu Berlin), and researchers at the University of Innsbruck and the Institute of Quantum Optics and Quantum Information, led by Rainer Blatt, has now demonstrated that a systematic error can occur when determining the position of particles that emit elliptically polarized light.

"The elliptical polarization causes the wavefronts of the light to have a spiral shape and to hit the imaging optics at a slight angle. This leads to the impression that the source of the light is somewhat off its actual position," explains Yves Colombe from Rainer Blatt's team. This could be relevant, for example, in biomedical research, where luminous proteins or nanoparticles are used as markers to determine biological structures. The effect that has now been proven would possibly lead to a distorted image of the actual structures.

Any kind of waves could show this behavior
More than 80 years ago, the physicist Charles G. Darwin, grandson of the British natural scientist Charles Darwin, predicted this effect. Since that time, several theoretical studies have substantiated his prediction.

Now, it has been possible for the first time to clearly prove the wave effect in experiments, and this twice: At the University of Innsbruck, physicists determined, through single photon emission, the position of a single barium atom trapped in an ion trap. Physicists at Atominstitut of TU Wien (Vienna) determined the position of a small gold sphere, about 100 nanometers in size, by analyzing its scattered light. ...Read More...

Scientists discover first high-temperature single-molecule magnet



Molecular structure of the high-temperature single-molecule magnet. Credit: Richard Layfield

A team of scientists led by Professor Richard Layfield at the University of Sussex has published breakthrough research in molecule-based magnetic information storage materials.

The group at the University of Sussex, working with collaborators at Sun-Yat Sen University in China and the University of Jyväskylä in Finland, report a new single-molecule magnet (SMM) - a type of material that retains magnetic information up to a characteristic blocking temperature.

Writing in the journal Science, Professor Layfield and his co-authors explain how they successfully designed and synthesized the first SMM with a blocking temperature above 77 K, the boiling point of liquid nitrogen, which is both cheap and readily available.

Previously, it was only possible to synthesize SMMs with blocking temperatures reachable by cooling with expensive and scarce liquid helium.

Professor of Chemistry, Richard Layfield, said: “Single-molecule magnets have been firmly stuck in the liquid-helium temperature regime for over a quarter of a century. Having previously proposed a blueprint for the molecular structure of a high-temperature SMM, we have now refined our design strategy to a level that allows access to the first such material.

“Our new result is a milestone that overcomes a major obstacle to developing new molecular information storage materials and we are excited about the prospects for advancing the field even further.”

SMMs are molecules capable of remembering the direction of a magnetic field that has been applied to them over relatively long periods of time once the magnetic field is switched off. As such, one can “write” information into molecules leading SMMs to have various potential applications, such as high-density digital storage ...Read More...

A Bose-Einstein condensate has been produced in space for the first time

Credit: CC0 Public Domain

An international team of researchers has successfully produced a Bose-Einstein condensate (BEC) in space for the first time. In their paper published in the journal Nature, the group describes creating a small experimental device that was carried on a rocket into space and the experiments that were conducted during its freefall.

A Bose-Einstein condensate is a state of matter occurring after gas atoms with very low density are chilled to very near absolute zero and bunch up to form an extremely dense quantum state. Scientists are interested in producing them so that they can test their properties—theory has suggested that they could serve as the basis for highly sensitive sensors. Such super-sensitive sensors could be used to better understand physics phenomena such as gravitational waves. However, producing Bose-Einstein condensates is tricky, because gravity interferes with devices for producing and studying them. The current method involves dropping such devices from towers to allow them to do their work in a zero-gravity environment—but these experiments have just fractions of seconds to operate. Doing these experiments in space would be a much better option due to the microgravity environment.

Realizing the potential of a space-based platform for conducting BEC research, the U.S. launched the Cold Atom Laboratory last May, though it is not yet fully functional. In the interim, the researchers with this new effort created a tiny device capable of producing a BEC and conducting a host of experiments on it, which they put aboard a rocket and launched into space.

The device consisted of a capsule containing a chip holding a group of rubidium-87 atoms, electronics, some lasers and a power source. It was activated once the rocket reached an altitude of 243 km, producing a BEC in just 1.6 seconds. Once the BEC was produced, 110 preprogrammed experiments were carried out in the six minutes it took the rocket to fall back to Earth. The BEC produced by the team was the first ever produced in space and marks the start of a new era in BEC research efforts. ...Read More...

Special Read:

NASA Wants to Send Humans to Venus, to Live in Airships Floating on Clouds

There are plans to cause HAVOC on Venus. Credit: Advanced Concepts Lab at NASA Langley Research Center

Popular science fiction of the early 20th century depicted Venus as some kind of wonderland of pleasantly warm temperatures, forests, swamps and even dinosaurs. In 1950, the Hayden Planetarium at the American Natural History Museum were soliciting reservations for the first space tourism mission, well before the modern era of Blue Origins, SpaceX and Virgin Galactic. All you had to do was supply your address and tick the box for your preferred destination, which included Venus.

Today, Venus is unlikely to be a dream destination for aspiring space tourists. As revealed by numerous missions in the last few decades, rather than being a paradise, the planet is a hellish world of infernal temperatures, a corrosive toxic atmosphere and crushing pressures at the surface. Despite this, NASA is currently working on a conceptual manned mission to Venus, named the High Altitude Venus Operational Concept –(HAVOC).

But how is such a mission even possible? Temperatures on the planet's surface (about 460 degrees Celsius) are in fact hotter than Mercury, even though Venus is roughly double the distance from the sun. This is higher than the melting point of many metals including bismuth and lead, which may even fall as "snow" onto the higher mountain peaks. The surface is a barren rocky landscape consisting of vast plains of basaltic rock dotted with volcanic features, and several continent-scale mountainous regions. ...Read More...

Europe, Japan ready spacecraft for 7-year journey to Mercury

Final preparations were underway Friday for the launch of a joint mission by European and Japanese space agencies to send twin probes to Mercury, the closest planet to the sun.

An Ariane 5 rocket is scheduled to lift the uncrewed spacecraft into orbit from French Guiana shortly before midnight, the start of a seven-year journey to the solar system's innermost planet.

The European Space Agency says the 1.3 billion-euro ($1.5 billion) mission is one of the most challenging in its history. Mercury's extreme temperatures, the intense gravity pull of the sun and blistering solar radiation make for hellish conditions.

The BepiColombo spacecraft will have to follow an elliptical path that involves a fly-by of Earth, two of Venus and six of Mercury itself so it can slow down sufficiently before arriving at its destination in December 2025.

Newly developed electrical ion thrusters will help nudge the spacecraft, which was named after Italian scientist Giuseppe "Bepi" Colombo, into the right orbit.

When it arrives, BepiColombo will release two probes—Bepi and Mio—that will independently investigate the surface and magnetic field of Mercury. The probes are designed to cope with temperatures varying from 430 degrees Celsius (806 F) on the side facing the sun, and -180 degrees Celsius (-292 F) in Mercury's shadow. ...Read More...

This Week's Sky at a Glance - Oct. 20-26, 2018

Oct 21	Su	21:03	Orionid Shower: ZHR = 20
Oct 24	We	04:43	Uranus Opposition
		20:45	Full Moon
Oct 26	Fr	18:13	Venus Inferior Conj.

SCASS Observatory Open House - Oct. 25, 2018

Special SCASS Summer Students Seminar - Oct. 28, 2018

Title: SCASS Summer Students Seminar
Lecturers: All SCASS Summer Students

Date: Sunday, Oct. 28, 2018
Time: 1200 – 13:30
Location: Al-Biruni Auditorium (UoS - M9)

Abstract

During more than three months (June - August 2018), SCASS hosted 21 UoS students to do their summer internships. Students were able to tackle several projects as related to the main five research laboratories at the center: Meteorite Center, Space Weather and Ionospheric Center, Radio Astronomy Laboratory, Martian Atmospheric Laboratory, and the CubeSat Laboratory. This special seminar will expose all the research done and the main results obtained by the students. These projects are funded by the UAE Space Agency, the Mohamed Bin Rashed Space Center, and he University of Sharjah through the CASTO program.