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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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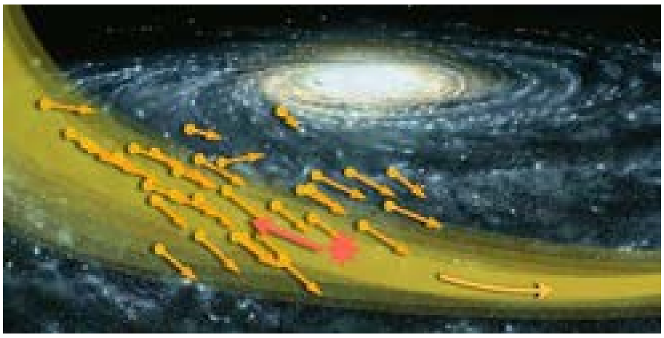
Dark matter 'hurricane' offers chance to detect axions



Credit: C. O'Hare; NASA/Jon Lomberg, via Physics

A team of researchers from Universidad de Zaragoza, King's College London and the Institute of Astronomy in the U.K. has found that a "dark matter hurricane" passing through our solar system offers a better than usual chance of detecting axions. In their paper published in the journal Physical Review D, the group describes their findings and why they believe their observations could offer help in understanding dark matter.

The evidence for the existence of dark matter is very strong, yet scientists are still unable to find a way to actually "see" it. Because of that, they keep trying to find new ways to do so. In this new effort, the researchers have been studying the S1 stream—a collection of stars moving in a way that suggests they were once part of a dwarf galaxy that was consumed by the Milky Way.

The S1 stream was discovered last year by a team studying data from the Gaia satellite. Other such streams have been observed before, but this is the first to cross paths with our own solar system. In this new effort, the researchers have studied the possible impact of S1 as it passed through our region, because it offers a unique opportunity to study dark matter.

As S1 moved through our area, theory suggests dark matter should have been moving along with it. Calculations by the team suggest it should be moving at approximately 500 km/s. They created several models showing the distribution of the dark matter and its density. Doing so allowed them to create predictions of possible signatures of the stream for researchers to look for. They suggest this event gives those in the field looking for observable evidence of dark matter a better than normal chance to do so. They suggest that it is not likely that WIMP detectors will find anything unusual. But they further suggest that the presence of a dark matter hurricane could increase the chances of detection of axionic dark matter due to possible bumps in the broad spectrum of axions. They note also that the current storm could offer data for use by future detection systems that are more advanced than those in use today.
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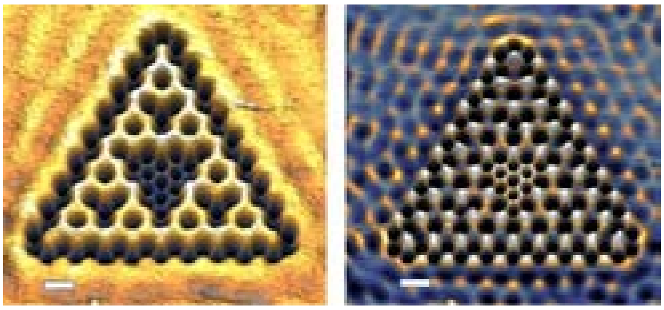
Physicists build fractal shape out of electrons



Electrons in bonding (left) and non-bonding (right) Sierpiński triangles; scale bar 2nm. Credit: Kempkes et al., Nature Physics, 2018

In physics, it is well-known that electrons behave very differently in three dimensions, two dimensions or one dimension. These behaviours give rise to different possibilities for technological applications and electronic systems. But what happens if electrons live in 1.58 dimensions – and what does it actually mean? Theoretical and experimental physicists at Utrecht University investigated these questions in a new study that will be published in Nature Physics on 12 November.

It may be difficult to imagine 1.58 dimensions, but the idea is more familiar to you than you think at first glance. Non-integer dimensions, such as 1.58, can be found in fractal structures, such as lungs. A fractal is a self-similar structure that scales in a different way than normal objects: If you zoom in, you will see the same structure again. For example, a small piece of Romanesco broccoli typically looks similar to the whole head of broccoli. In electronics, fractals are used in antennas for their properties of receiving and transmitting signals in a large frequency range.

A relatively new topic in fractals is the quantum behaviour that emerges if you zoom in all the way to the scale of electrons. Using a quantum simulator, Utrecht physicists Sander Kempkes and Marlou Slot were able to build such a fractal out of electrons. The researchers made a 'muffin tin' in which the electrons would confine to a fractal shape, by placing carbon monoxide molecules in just the right shape on a copper background with a scanning tunneling microscope. The resulting triangular fractal shape in which the electrons were confined is called a Sierpiński triangle, which has a fractal dimension of 1.58. The researchers observed that the electrons in the triangle actually behave as if they live in 1.58 dimensions.

The results from the study show how bonding (left image) and non-bonding Sierpiński (right image) triangles are separated in energy, yielding nice opportunities for transmitting currents through these fractal structures. In the bonding case, the electrons are connected and can easily go from one place to another (high transmission), whereas in the non-bonding case they are not connected and need to "jump" to another place (low transmission). Also, by calculating the dimension of the electronic wavefunction, the researchers observed that the electrons ...Read More...

Scientists Spot What May Be a Giant Impact Crater Hidden Under Greenland Ice

An aerial view of northwest Greenland, with the location of what appears to be a giant impact crater circled in red. Credit: Natural History Museum of Denmark

Earth hides its scars well; the planet has endured countless millennia of eruptions and collisions, but scientists are still stumbling upon the evidence of all that geologic drama.

Now, one such team has announced that it spotted a scar hidden below Greenland's ice, a giant crater nearly 20 miles (31 kilometers) wide. The researchers said a giant iron meteorite likely created the mark by slamming into Earth sometime in the past 3 million years.

Other scientists aren't necessarily sold yet that a space rock created the feature. "I think that the authors have presented some intriguing evidence of a possible impact site, and I think that's the right word — intrigued," David Kring, who studies impact craters at the Lunar and Planetary Institute in Houston and who wasn't involved with the new research, told Space.com. "I'm intrigued. I'm not wholly convinced that this is an impact crater."

The feature in question is tucked below the edge of the ice sheet in northwest Greenland, lending a semicircular edge to the ice sheet near where a glacier called Hiawatha flows toward the sea. Looking through data originally gathered to track changes in the ice itself, scientists spotted a strangely circular feature in the bedrock, so they arranged for a high-powered ice-penetrating radar instrument to fly over the area.

That instrument's data confirmed the structure of the feature itself: a depression large enough to hold all of Paris in its embrace, with a clearly defined rim all the way around. So, scientists flew in to gather samples in person, looking for chemical fingerprints of an exotic event that could have formed the feature.

And while the glacier blocks the scientists from reaching the heart of the crater, it makes up for that inconvenience by ferrying sediment out from the site in meltwater. "It's almost like a home delivery," Kurt Kjær, lead author of the study and a geologist at the Natural History Museum of Denmark at the University of Copenhagen ..Read More...

Icy 'Super-Earth' Exoplanet Spotted Around Nearby Barnard's Star

An artist's illustration of the surface of the "super-Earth" planet candidate detected around Barnard's star, which lies just 6 light-years from the sun. Credit: M. Kornmesser/ESO

The nearest single star to the sun apparently hosts a big, icy planet.

Astronomers have found strong evidence of a frigid alien world about 3.2 times more massive than Earth circling Barnard's Star, a dim red dwarf that lies just 6 light-years from the sun. Barnard's Star is our sun's nearest neighbor, apart from the three-star Alpha Centauri system, which is about 4.3 light-years away.

The newly detected world, known as Barnard's Star b, remains a planet candidate for now. But the researchers who spotted it are confident the alien planet will eventually be confirmed.

"After a very careful analysis, we are 99 percent confident that the planet is there," Ignasi Ribas, of the Institute of Space Studies of Catalonia and the Institute of Space Sciences in Spain, said in a statement.

"However, we'll continue to observe this fast-moving star to exclude possible, but improbable, natural variations of the stellar brightness which could masquerade as a planet," added Ribas, the lead author of a new study announcing the detection of Barnard's Star b. That study was published online today (Nov. 14) in the journal Nature.

Barnard's Star b, if confirmed, will not be the nearest exoplanet to Earth. That designation is held by the roughly Earth-size world Proxima b, which orbits Proxima Centauri, one of the Alpha Centauri trio.

NASA's Kepler space telescope showed that small planets are common in the Milky Way galaxy at large. Together, Proxima b and Barnard's Star b strongly suggest that such worlds "are also common in our neighborhood," study co-author Johanna Teske, of the Department of Terrestrial Magnetism at the Carnegie Institution for Science in Washington, D.C., told Space.com. "And that is super-exciting." the full moon every 180 years. This unparalleled apparent motion is a consequence of the proximity of Barnard's Star and its high (but not record-setting) ...Read More...

Gravitational waves from a merged hyper-massive neutron star

File Illustration Only

For the first time, astronomers have detected gravitational waves from a merged, hyper-massive neutron star. The scientists, Maurice van Putten of Sejong University in South Korea, and Massimo della Valle of the Osservatorio Astronomico de Capodimonte in Italy, publish their results in Monthly Notices of the Royal Astronomical Society: Letters.

Gravitational waves were predicted by Albert Einstein in his General Theory of Relativity in 1915. The waves are disturbances in space-time generated by rapidly moving masses, which propagate out from the source.

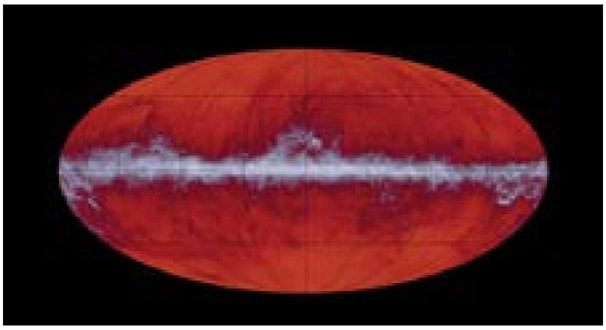
By the time the waves reach Earth, they are incredibly weak and their detection requires extremely sensitive equipment. It took scientists until 2016 to announce the first observation of gravitational waves using the Laser Interferometer Gravitational Wave Observatory (LIGO) detector.

Since that seminal result, gravitational waves have been detected on a further six occasions. One of these, GW170817, resulted from the merger of two stellar remnants known as neutron stars. These objects form after stars much more massive than the Sun explode as supernovae, leaving behind a core of material packed to extraordinary densities.

At the same time as the burst of gravitational waves from the merger, observatories detected emission in gamma rays, X-rays, ultraviolet, visible light, infrared and radio waves - an unprecedented observing campaign that confirmed the location and nature of the source.

The initial observations of GW170817 suggested that the two neutron stars merged into a black hole, an object with a gravitational field so powerful that not even light can travel quickly enough to escape its grasp. Van Putten and della Valle set out to check this, using a novel technique to analyze the data from LIGO and the Virgo gravitational wave detector sited in Italy. Their detailed analysis shows the H1 and L1 detectors in LIGO, which are separated by more than 3,000 kilometers, simultaneously...Read More...

Hints of Oort clouds around other stars may lurk in the universe's first light



HIDDEN TREASURES This map of the cosmic microwave background taken by the Planck satellite could also hide signs of exo-Oort clouds – planetary graveyards surrounding other stars.

A thick sphere of icy debris known as the Oort cloud shrouds the solar system. Other star systems may harbor similar icy reservoirs, and those clouds may be visible in the universe's oldest light, researchers report.

Astronomer Eric Baxter of the University of Pennsylvania and colleagues looked for evidence of such exo-Oort clouds in maps of the cosmic microwave background, the cool cosmic glow of the first light released after the Big Bang, roughly 13.8 billion years ago. No exo-Oort clouds have been spotted yet, but the technique looks promising, the team reports November 2 in the Astronomical Journal. Finding exo-Oort clouds could help shed light on how other solar systems – and perhaps even our own – formed and evolved.

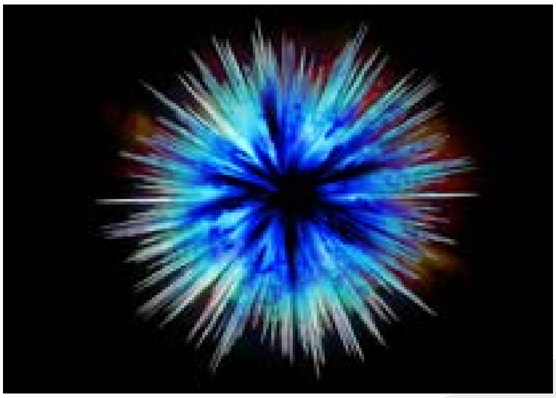
The Oort cloud is thought to be a planetary graveyard stretching between about 1,000 and 100,000 times as far from the sun as Earth. Scientist think that this reservoir of trillions of icy objects formed early in the solar system's history, when violent movements of the giant planets as they took shape tossed smaller objects outward. Every so often, one of those frozen planetary fossils dives back in toward the sun and is visible as a comet.

But it's difficult to observe the Oort cloud directly from within it. Despite a lot of circumstantial evidence for the Oort cloud's existence, no one has ever seen it.

Ironically, exo-Oort clouds might be easier to spot, Baxter and colleagues thought. The objects in an exo-Oort cloud wouldn't reflect enough starlight to be seen directly, but they would absorb starlight and radiate it back out into space as heat. For the sun's Oort cloud, that heat signal would be smeared evenly across the entire sky from Earth's perspective. But an exo-Oort cloud's warmth would be limited to a tiny region around its star.

Baxter and colleagues calculated that the expected temperature of an exo-Oort cloud should be about -265° Celsius, or 10 kelvins. That's right in range for experiments that detect the cosmic microwave ...Read More...

Infinite-dimensional symmetry opens up possibility of a new physics—and new particles



Credit: CC0 Public Domain

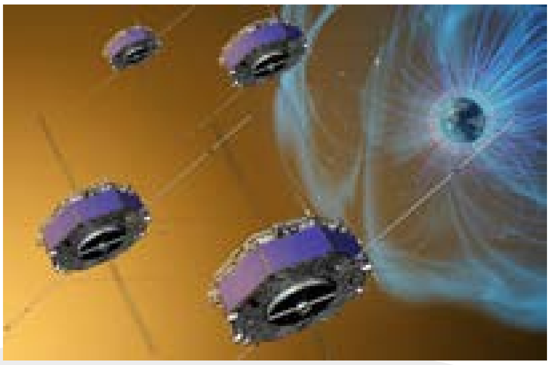
The symmetries that govern the world of elementary particles at the most elementary level could be radically different from what has so far been thought. This surprising conclusion emerges from new work published by theoreticians from Warsaw and Potsdam. The scheme they posit unifies all the forces of nature in a way that is consistent with existing observations and anticipates the existence of new particles with unusual properties that may even be present in our close environs.

For a half-century, physicists have been trying to construct a theory that unites all four fundamental forces of nature, describes the known elementary particles and predicts the existence of new ones. So far, these attempts have not found experimental confirmation, and the Standard Model—an incomplete, but surprisingly effective theoretical construct—is still the best description of the quantum world. In a recent paper in Physical Review Letters, Prof. Krzysztof Meissner from the Institute of Theoretical Physics, Faculty of Physics, University of Warsaw, and Prof. Hermann Nicolai from the Max-Planck-Institut für Gravitationsphysik in Potsdam have presented a new scheme generalizing the Standard Model that incorporates gravitation into the description. The new model applies a kind of symmetry not previously used in the description of elementary particles.

In physics, symmetries are understood somewhat differently than in the colloquial sense of the word. For instance, whether a ball is dropped now or one minute from now, it will still fall in the same way. That is a manifestation of a certain symmetry: the laws of physics remain unchanged with respect to shifts in time. Similarly, dropping the ball from the same height in one location has the same result as dropping it in another. This means that the laws of physics are also symmetrical with respect to spatial operations.

"Symmetries play a huge role in physics because they are related to principles of conservation. For instance, the principle of the conservation of energy ...Read More...

Scientists provide first-ever views of elusive energy explosion



Artist depiction of the MMS spacecraft that provided the first view of magnetic reconnection. Credit: NASA/GSFC

Researchers at the University of New Hampshire have captured a difficult-to-view singular event involving "magnetic reconnection"—the process by which sparse particles and energy around Earth collide producing a quick but mighty explosion—in the Earth's magnetotail, the magnetic environment that trails behind the planet.

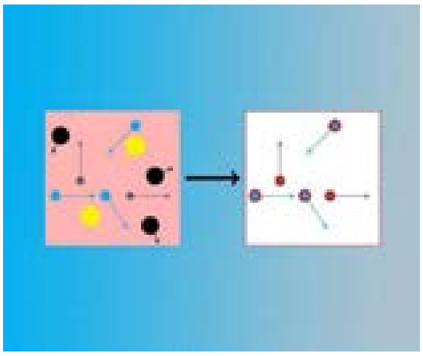
Magnetic reconnection has remained a bit of a mystery to scientists. They know it exists and have documented the effects that the energy explosions can have—sparking auroras and possibly wreaking havoc on power grids in the case of extremely large events—but they haven't completely understood the details. In a study published in the journal Science, the scientists outline the first views of the critical details of how this energy conversion process works in the Earth's magnetotail.

"This was a remarkable event," said Roy Torbert of the Space Science Center at UNH and deputy principal investigator for NASA's Magnetospheric Multiscale mission, or MMS. "We have long known that it occurs in two types of regimes: asymmetric and symmetric but this is the first time we have seen a symmetric process."

Magnetic reconnection occurs around Earth every day due to magnetic field lines twisting and reconnecting. It happens in different ways in different places, with different effects. Particles in highly ionized gases, called plasmas, can be converted and cause a single powerful explosion, just a fraction of a second long, that can lead to strong streams of electrons flying away at supersonic speeds. The view, which was detected as part of the scientists' work on the MMS mission, had enough resolution to reveal its differences from other reconnection regimes around the planet like the asymmetric process found in the magnetopause around Earth which is closer to the sun.

"This is important because the more we know and understand about these reconnections," said Torbert, "the more we can prepare for extreme events that are possible from reconnections around the Earth or ...Read More...

New finding of particle physics may help to explain the absence of antimatter



Sketch of dimensional reduction.

In the Standard Model of particle physics, there is almost no difference between matter and antimatter. But there is an abundance of evidence that our observable universe is made up only of matter - if there was any antimatter, it would annihilate with nearby matter to produce very high intensity gamma radiation, which has not been observed. Therefore, figuring out how we ended up with an abundance of only matter is one of the biggest open questions in particle physics.

Because of this and other gaps in the Standard Model, physicists are considering theories which add a few extra particles in ways that will help to solve the problem. One of these models is called the Two Higgs Doublet Model, which, despite the name, actually adds four extra particles.

This model can be made to agree with all particle physics observations made so far, including ones from the Large Hadron Collider at CERN, but it was unclear whether it could also solve the problem of the matter-antimatter imbalance. The research group, led by a University of Helsinki team, set out to tackle the problem from a different angle. Their findings have now been published in a paper in the Physical Review Letters.

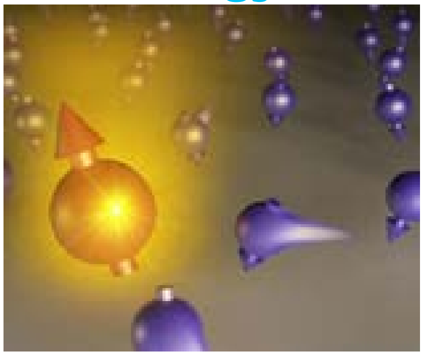
About ten picoseconds after the Big Bang - right about the time the Higgs boson was turning on - the universe was a hot plasma of particles.

“The technique of dimensional reduction lets us replace the theory which describes this hot plasma with a simpler quantum theory with a set of rules that all the particles must follow”, explains Dr. David Weir, the corresponding author of the article.

“It turns out that the heavier, slower-moving particles don’t matter very much when these new rules are imposed, so we end up with a much less complicated theory.”

This theory can then be studied with computer simulations, which provide a clear picture of what happened. In particular, they can tell us how violently out of equilibrium the universe was when the Higgs boson turned on. This is important for determining whether there was scope for producing the matter-antimatter asymmetry at this time in the history of the universe using ...Read More...

Doubly-excited electrons reach new energy states



File Illustration Only.

Positrons are short-lived subatomic particle with the same mass as electrons and a positive charge. They are used in medicine, e.g. in positron emission tomography (PET), a diagnostic imaging method for metabolic disorders. Positrons also exist as negatively charged ions, called positronium ions (Ps-), which are essentially a three-particle system consisting of two electrons bound to a positron.

Now, commercially available lasers are capable of producing photons that carry enough energy to bring the electrons of negatively charge ions, like Ps?, to doubly-excited states, referred to as D-wave resonance. Positronium ions are, however, very difficult to observe because they are unstable and often disappear before physicists get a chance to analyse them.

Sabyasachi Kar from the Harbin Institute of Technology, China, and Yew Kam Ho from the Academia Sinica, Taipei, Taiwan, have now characterised these higher energy levels reached by electrons in resonance in these three-particle systems, which are too complex to be described using simple equations.

This theoretical model, recently published in EPJ D, is intended to offer guidance for experimentalists interested in observing these resonant structures. This model of a three-particle system can be adapted to problems in atomic physics, nuclear physics, and semiconductor quantum dots, as well as antimatter physics and cosmology.

In this study, the authors first test the validity of their theoretical approach by showing that the resonance parameters for negatively charged hydrogen ions (H-) - modelled as a three-particle system made up of two electrons and one proton - are in agreement with previous studies.

The authors then calculate, for the first time, new resonance states associated with the positronium ion (Ps-) in higher energy regions by modelling it as a three-particle system. In turn, they elaborate on seven modes of resonance for the electrons that have never before been reported. ...Read More...

'Ghost moons' discovered in orbit around Earth

Artist's impression of the Kordylewski cloud in the night sky (with its brightness greatly enhanced) at the time of the observations.G. Horv?th / Royal Astronomical Society

Everyone knows Earth has only one moon — or is it three? Astronomers in Hungary say they've detected a pair of what some call "ghost moons" orbiting our planet not far from the moon we all know.

The hazy clouds of dust — tens of thousands of miles across but too faint to be seen with the naked eye — were first detected almost 60 years ago by a Polish astronomer, Kazimierz Kordylewski. But the patches of light he found were too indistinct to convince some scientists that the clouds were really there, and the existence of the "Kordylewski clouds" has long been a matter of controversy.

Now the astronomers, Gabor Horvath and Judit Sliz-Balogh of Eötvös Loránd University in Budapest, have obtained clear evidence of the clouds using a specially equipped telescope in a private observatory in western Hungary.

In the new images, published Oct. 2 in the journal Monthly Notices of the Royal Astronomical Society, the so-called Kordylewski clouds appear as indistinct patches of light against the darkness of space — though they show up clearly in an artist's rendering that greatly exaggerates their brightness.

"Think of them like the cloud of dust you get when a car drives down a dirt road," astronomer Phillip Plait, who writes the popular Bad Astronomy blog, told NBC News MACH in an email. "So they're not really 'moons' in the usual sense."

The Kordylewski clouds orbit Earth at roughly the same distance as the moon — about 250,000 miles away. One cloud orbits ahead of the moon and the other behind in specific regions of the sky where Earth's gravitational pull is canceled out by the moon's. Known as Lagrange points, these regions act as "gravitational vacuum-cleaners," collecting dust and gas that can persist for decades, Horvath said in an email.

"The idea here is that when you have a biggish object, like the Earth, orbited by a smaller one, like the moon, there are regions of space where the centrifugal force balances gravity," Plait said. "Put a much smaller object there, and it'll stay there for a long time." ...Read More...

Astronomers detect once-in-a-lifetime gamma rays

UD Professor Jamie Holder (left) and doctoral student Tyler Williamson have been studying gamma rays with the help of the VERITAS telescopes located at the Fred Lawrence Whipple Observatory in Amado, Arizona. Credit: University of Delaware

Scientists have discovered something amazing.

In a cluster of some of the most massive and luminous stars in our galaxy, about 5,000 light years from Earth, astronomers detected particles being accelerated by a rapidly rotating neutron star as it passed by the massive star it orbits only once every 50 years.

The discovery is extremely rare, according to University of Delaware astrophysicist Jamie Holder and doctoral student Tyler Williamson, who were part of the international team that documented the occurrence.

Holder called this eccentric pair of gravitationally linked stars a "gamma-ray binary system" and likened the once-in-a-lifetime event to the arrival of Halley's comet or last year's U.S. solar eclipse.

Massive stars are among the brightest stars in our galaxy. Neutron stars are extremely dense and energetic stars that result when a massive star explodes.

This binary system is a massive star with a neutron star orbiting around it. Of the 100 billion stars in our galaxy, less than 10 are known to be this type of system.

Even fewer—only two systems, including this one—are known to have an identified neutron star, or pulsar, that emits pulses of radio waves that scientists can measure. This is important because it tells astronomers very accurately how much energy is available to accelerate particles, something scientists know little about.

"You couldn't ask for a better natural laboratory to study particle acceleration in a continually changing environment - at energies far beyond anything we can produce on the Earth," said Holder, a professor in UD's Department of Physics and Astronomy.

The project was led by a team of scientists, including Holder and Williamson, using the VERITAS telescope array at the Fred Lawrence Whipple Observatory in Arizona, in collaboration with scientists using the ...Read More...

Special Read:

What is absolute zero?

The Boomerang Nebula is about 5,000 light-years from Earth. Measurements show it has a temperature of only one degree Kelvin above absolute zero (nearly -458 degrees Fahrenheit), making it the coldest location in the known universe.NASA, ESA and The Hubble Heritage Team (STScI/AURA)

Science is full of zeroes. Light has zero mass. Neutrons have zero charge. A mathematical point has zero length. Those zeroes might be unfamiliar, but they follow a consistent logic. All represent the absence of a certain quality: mass, electric charge, distance. Then there is the puzzling case of absolute zero.

We tend to think of hot and cold as relative things. A cup of hour-old tea, for example, is colder than the fire on your stove but hotter than an ice cube. Absolute zero represents the coldest possible temperature, which defies the this-versus-that pattern. Stranger still, absolute zero isn't even zero on the temperature scales used by nonscientists. It's minus 273.15 degrees on the Celsius scale, or minus 459.67 degrees Fahrenheit.

How can there be a lowest temperature?

The key to decoding absolute zero is understanding what temperature is. It's simply a measure of how fast the atoms or molecules within a substance are moving — or, to be more precise, the average kinetic energy of those particles.

Think of it as a game of atomic dodgeball. When the ball hits you, you feel its energy. Trillions and trillions of those dodgeball hits, happening on an invisibly small scale, are what we perceive as temperature.

Fast-moving atoms hit hard, which we feel as a high temperature. When a hot object touches a cold object, the faster, hotter atoms impart some of their velocity to the slower, colder ones. The hot object cools. The cool object grows warmer.

Now the zero in absolute zero makes sense: Absolute zero is the temperature at which the particles in a substance are essentially motionless. There's no way to slow them down further, so there can be no lower temperature.

Does everything stop moving at absolute zero? Not quite. Atoms aren't entirely still; they wobble as a result of effects related to quantum physics. And, of course, the activity within each atom continues no matter how cold it gets. Electrons keep moving, as do protons and neutrons.

Who discovered absolute zero?

Guillaume Amontons, a French inventor who lost his hearing in childhood and never went to college, figured out the basic concept in 1702. His experiments showed that air pressure is proportional to temperature, and he deduced that there was a minimum temperature at which pressure would drop to nothing. He even made an estimate of that temperature, minus 240 degrees C — remarkably close to the actual value.

In 1848, the Scottish-Irish physicist William Thomson, better known as Lord Kelvin, extended Amontons' work, developing what he called an "absolute" temperature scale that would apply to all substances. He set absolute zero as 0 on his scale, getting rid of the unwieldy negative numbers. Physicists now rely on the Kelvin (K) scale for temperature measurements. ..Read More...

This Week's Sky at a Glance - Nov. 17-23, 2018

Nov 18	Su	03:05	Leonid Shower: ZHR = 15
Nov 23	Fr	09:39	Full Moon

Memories of the First Sharjah International Conference on Particle Physics, Astrophysics and Cosmology (FISICPAC) University of Sharjah (UoS) - November 11 to 13, 2018.

The first Sharjah International Conference on Particle Physics, Astrophysics and Cosmology (FISICPAC) that was held at the University of Sharjah between Nov. 11-13, 2018 was a great success. Prominent scholars from over the main research institutions of high energy physics attended the conference: Prof. Fernando Quevedo (Abdus Salam International Center for Theoretical Physics, ICTP, Italy), Prof. Patrick Fassnacht (CERN - Switzerland), Prof. John Ellis (King's College London, UK), Prof. Karl Jakobs (University of Freiburg, Germany), Prof. Bobby Acharya (King's College London, UK), Prof. Salah Nasri (UAEU), Prof. Martin A. Barstow (Leicester University, UK), Prof. Andreas Eckart (Koln University, Germany), and Prof. Albert De Roeck (University of Antwerp, Belgium). Tens of other scientists from different disciplines also took part in the series of talks presented during the conference. At the closure ceremony, Prof. Gaffar Attaelmanan, the Chairman of the Applied Physics and Astronomy Department (University of Sharjah) gave some final words thanking HE Prof. Hamid Al-Naimiy, the Chancellor of the University of Sharjah, for his great support that made the conference a very successful one. Prof. Atta emphasized the role of Dr. Rachik Soualah, Assistant Professor of Physics at UoS. Dr. Rachik initiated the idea of the conference, and through his multiple connections with the CERN and ICTP groups, he was able to convince all of the prominent scientists mentioned above to take part in the conference. This is to say that if it were not for his connections, the conference would not have taken place.

One of the highlights of FISICPAC 2018 is the signature of an MOU between the University of Sharjah and ICTP. Prof. Hamid and Prof. Francesco signed the MOU in front of His Highness Dr. Sheikh Sultan Bin Mohammed Al Qasimi, Supreme Council Member and Ruler of Sharjah and President of the University of Sharjah. This MOU will allow more cooperation between the two institutions in terms of students exchange and common research programs.

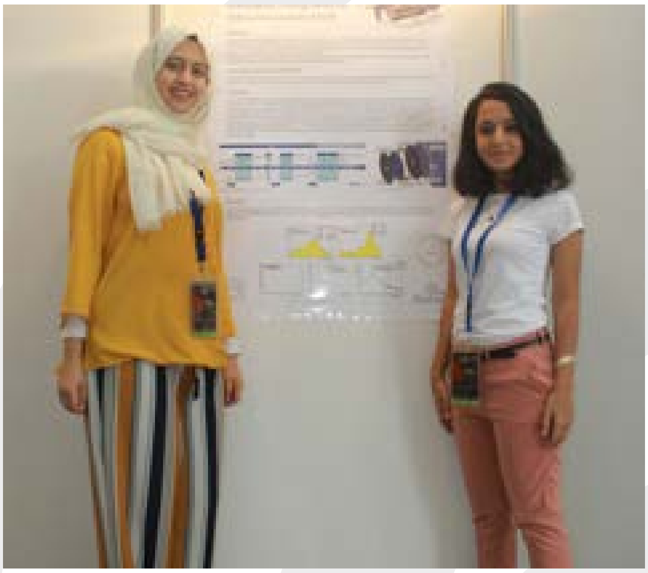
The conference attendees during a visit to the Sharjah Center for Astronomy and Space Sciences on Nov. 11, 2018

UoS/SCASS Research Assistants at FISICPAC 2018

Serveral students and research assistants at the University of Sharjah and the Sharjah Center for Astronomy and Space Sciences presented posters at the FISICPAC 2018.

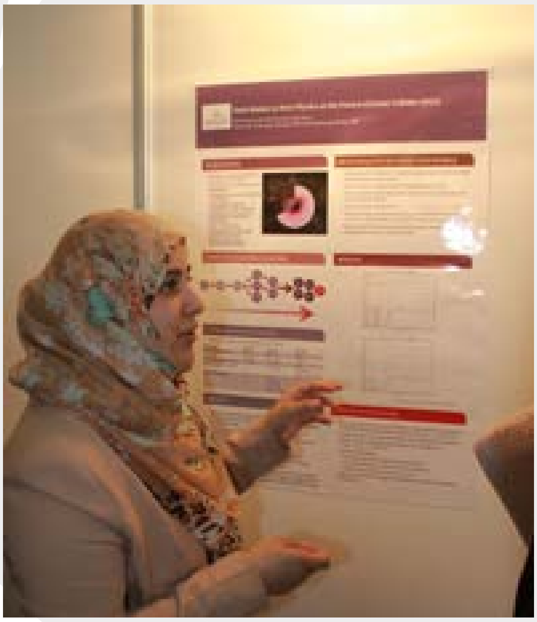
Mr. Mohamed Talafha (SCASS Researcher)

Ms. Noora Mohamad Al-Ameri (SCASS Researcher)



Ms. Hoda Al-Gendy and Ms. Maitha Al-Shamsi (UoS / SCASS Researchers)

Ms. Salwa Haitham Shaglel (UoS Student)



Ms. Safa Naseem (SCASS Researcher)

SCASS Organized a Special Seminar for FISICPAC 2018 (Nov. 11, 2018)

The Sharjah Center for Astronomy and Space Sciences organized a special seminar and dinner to the attendees of FISCPAC 2018. Dr. Ilias Fernini, the Deputy General Director for the Research Laboratories and Observatory, welcomed the guests and presented a summary of all the research done at the Center. He emphasized the special nature of the center as having several laboratories and centers: (1) Meteorite Center, (2) Radio Astronomy Laboratory, (3) Space Weather and Ionospheric Laboratory, (4) Astronomical Observatory), (5) CubeSat Laboratory, and a (5) GIS/RS Center. More laboratories are planned to open in the near future like the "High Energy Astrophysics/ Physics Laboratory", the "Planetary Atmospheric Laboratory", and the "Artificial Laboratory." Presently, SCASS has three faculty members and six research permanent research assistants working at the different laboratories. The center also has more than 100 students from the University of Sharjah actively participating in all of the main research areas of the center.