Apr. 21, 2018 Shaaban 05, 1439 AH Volume 8, Issue 16

Astronomy & Physics Weekly News

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Top News

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Unveiling the secrets of the Milky Way galaxy

A montage of Galactic gamma-ray sources in the Milky Way above the H.E.S.S. telescopes in Namibia. Credit: Namibia: F. Acero, with a gamma-ray source map: HESS Collaboration

A multinational team of astronomers involving the University of Adelaide has catalogued over 70 sources of very high energy gamma rays, including 16 previously undiscovered ones, in a survey of the Milky Way using gamma ray telescopes.

Gamma rays are the highest energy form of light. They are studied by astronomers and astrophysicists around the world because they can be used to trace the origins of cosmic rays, elusive charged particles which are an important ingredient in the evolution of the Universe.

Using the High Energy Stereoscopic System (HESS) gamma ray telescopes in Namibia, the researchers have surveyed the Milky Way in gamma ray light for the past 15 years.

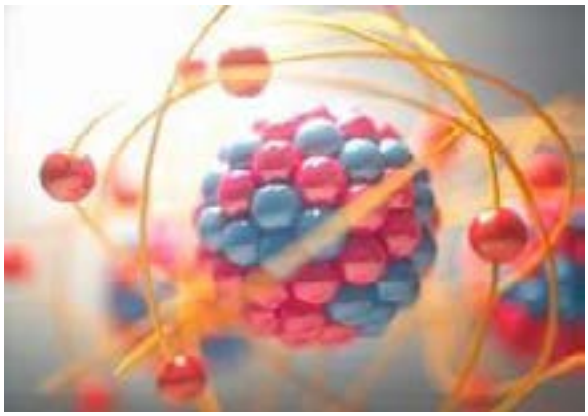
The results have been published in 14 scientific papers in a special edition of the journal Astronomy and Astrophysics, including details of a particularly intriguing new source of gamma rays.

"This particular source of gamma rays was found towards an unusual cluster of stars which harbours one of the Milky Way's most massive and energetic young stars, a luminous blue variable star called LBV1806-20," says Associate Professor Gavin Rowell, from the University of Adelaide's High Energy Astrophysics Group and leader of Australia's participation in HESS.

"The cluster of stars also harbours a rare, extremely magnetic, neutron star known as a magnetar, but we think the gamma ray emission could be linked to the luminous blue variable star.

"If the source is the luminous blue variable star, it is the first time that gamma ray emission has been linked to such a massive star. Many of the other gamma ray emission sources, in this very high energy band, have so far been linked to pulsars or supernova remnants (the remains of an exploding star). This would mean a new ...Read More...

Scientists introduce magnetic data storage of the future



Credit: ktsdesign, Shutterstock

Single-molecule magnets (SMMs) have been attracting a lot of attention recently. This is because of the increased demand for faster, longer-lasting and lower-energy IT systems, and the need for higher data storage capacity.

Partially supported by the EU-funded project PhotoSMM, researchers have introduced a novel design for SMMs which could lead to information storage on a nanometric scale. Their findings were published recently in the Angewandte Chemie journal. SMMs are a type of complex compound that can retain magnetic information at low temperatures. As explained by Dr Lucie Norel, one of the researchers in the team, "because of the prominent use of magnetisation-based information storage technologies in our daily life, SMM which are able to interconvert between two states with opposite magnetisation directions receive a great deal of attention."

Summarising the project objectives on CORDIS, she added: "The potential is huge for SMM systems that would demonstrate magnetic field and light-driven changes in both their optical and magnetic properties because they could reproduce on a single molecule the same type of magneto-optical effects which are used for some current data storage technologies."

Limitations of SMM

Computer hard discs are made up of magnetic material which records digital signals. The smaller the tiny magnets, the more information they can store. Even though hard disk drives are now measured in thousands of gigabytes rather than tens, there's still a need for developing new means of data storage that are dense and energy efficient. For example, in 2017 a group of researchers at IBM demonstrated the world's smallest magnetic memory storage device built around a single atom, as presented in the 'IEEE Spectrum' magazine. It's also possible to design molecules with customised magnetic properties which could have applications in quantum computing, thanks to the synthetic chemistry techniques developed by scientists working on SMMs. ..Read More...

Simulations suggest Saturn may have helped create Jupiter's big moons

Credit: CC0 Public Domain

A team of researchers from France and the U.S. has created a computer simulation of the development of the solar system focusing on Jupiter and the origins of its moons. In their paper uploaded to the arXiv preprint server, the group describes the simulation showing that Saturn may have played a role in the creation of Jupiter's largest moons.

Most space scientists agree that most, if not all, of Jupiter's smallest moons came to our solar system from elsewhere—on the other hand, the four largest moons, Ganymede, Io, Callisto and Europa are believed to have originated near the planet itself—but, as the researchers with new effort note, there is a problem with this theory. How could they have formed from nearby material if Jupiter cleared a track around the sun, as theory also suggests, via gravitationally attracting everything in its path as Jupiter formed? To learn more and possibly solve that problem, the researchers built a computer simulation to show what might have happened as Jupiter and other nearby planets formed.

The simulation showed, the team reports, that Saturn may have played a role in the creation of Jupiter's moons by moving close enough to Jupiter to disrupt material orbiting the sun at the edges of the path cleared by the larger planet—causing some of the material to enter that cleared space. That material, the simulation further showed, could have coalesced to form the four large moons that we see today.

If further study backs up the simulation, the group suggests, their findings may have an impact on the study of other solar systems—those that have many planets, they note, might have undergone a similar process. In such cases, scientists might want to take a closer look at the larger planets to see if they also have large moons that could be harboring life.

The simulation suggests a plausible scenario surrounding the development of Jupiter's larger moons, the researchers note, but it still does not explain why those four moons are made of different kinds of materials—it would seem logical to assume that they would be very similar ...Read More...

Successful Launch for NASA's TESS Exoplanet Mission

NASA's next planet-hunter, the Transiting Exoplanet Survey Satellite, successfully launched on a SpaceX Falcon 9 on April 18, 2018. TESS will search for new worlds outside our solar system for further study. NASA Television

Another planet-hunter is on its way to search for strange new worlds. The Transiting Exoplanet Survey Satellite (TESS) launched successfully on April 18th at 6:51 p.m. EDT aboard a SpaceX Falcon 9 rocket to survey the entire sky for exoplanets.

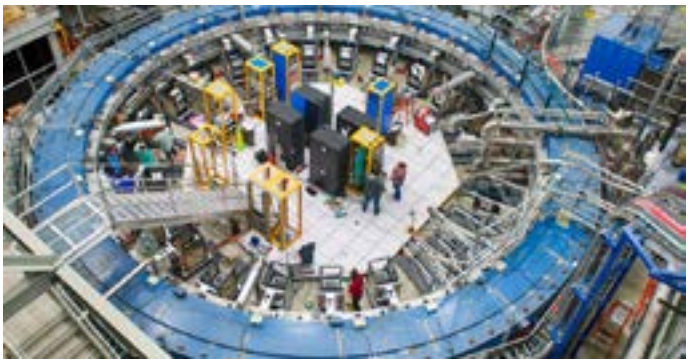
The mission is coming just in time, as NASA's epic exoplanet mission, Kepler, is dying. Recently, the agency announced the spacecraft will run out of fuel in the coming months. Like Kepler, TESS will be looking for the brief dips in starlight created when exoplanets transit their stars. But unlike Kepler, which aimed to take a census of planets around Sun-like stars and therefore aimed toward a small field containing hundreds of thousands of mostly faraway stars, TESS will be examining the brightest stars near Earth. The planets it finds will be more easily studied through follow-up observations on the ground and in space.

Funding has been approved for the mission's first two years, but George Ricker (MIT), TESS's principal investigator, says the spacecraft is built to last: ""TESS will be able to operate for 10 or 20 years." So far, the mission has cost less than $200 million, excluding launch expenses.

The spacecraft will operate in a lunar-resonant orbit, dubbed P/2, that requires a minimum of operational fuel. TESS will circle Earth every 13.7 days - half of the Moon's orbital period. This orbit is extremely stable and maximizes TESS's ability to view the entire sky. It also allows TESS to send full-frame images back to Earth on every close pass.

After launch TESS orbited Earth three times. Next, it will perform a lunar flyby. "We get a gravitational assist by going by the Moon, and we don't have to use as much propulsion in adjusting the orbit," Ricker says. "We [also] put the orbit inclination up to about 40 degrees relative to the ecliptic," he adds. Otherwise, TESS would experience Moon or Earth eclipses every month, limiting its observations. TESS's final orbit will have a perigee of 67,000 miles (110,000 kilometers) and an apogee of 232,000 miles (373,000 kilometers). ..Read More...

Muons spin tales of undiscovered particles



Scientists from Argonne National Laboratory and Fermi National Accelerator Laboratory, along with collaborators from over 25 other institutions, are recreating a previous experiment with much higher precision. The original experiment measured the spin precession of the muon — i.e., the speed at which its spin changes direction — to be different from the theoretical predictions. With this one, scientists plan to confirm or disprove the earlier results. Credit: Fermi National Accelerator Laboratory / Reidar Hahn

Scientists at U.S. Department of Energy (DOE) national laboratories are collaborating to test a magnetic property of the muon. Their experiment could point to the existence of physics beyond our current understanding, including undiscovered particles.

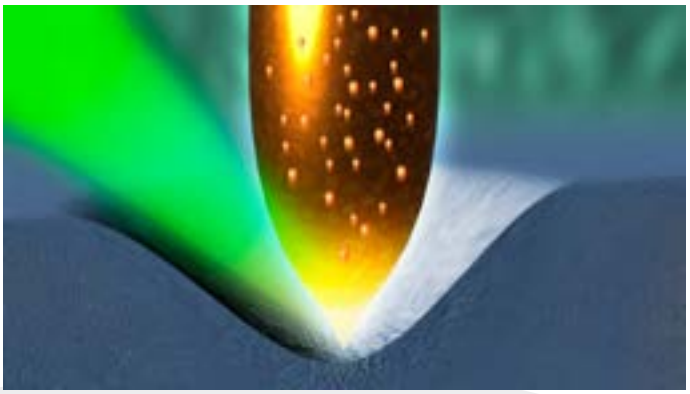
The experiment follows one that began in 1999 at the DOE's Brookhaven National Laboratory in which scientists measured the spin precession of the muon—i.e., the speed at which its spin changes direction—to be different from the theoretical predictions. Scientists from Argonne National Laboratory and Fermi National Accelerator Laboratory, along with collaborators from more than 25 other institutions, are recreating the experiment with much higher precision to confirm or disprove the former earlier results.

The muon is like the (very) big brother of the electron; they have the same charge, but the muon is over 200 times more massive. The two also share the same spin, a quantum mechanical property that determines a particle's behavior in the presence of a magnetic field.

Particles with spin act like tiny magnets, and when placed in a magnetic field, their spins change direction in a circular motion, much like a spinning gyroscope. The speed of a particle's spin precession is determined by a quantity known as its g-factor, which depends on the particle's spin and the strength of the magnetic field in which it moves.

In modern quantum mechanical theories, the vacuum is not empty. It is full of bubbles of so-called virtual particles, appearing and disappearing very quickly. Interactions between these virtual particles and a real particle, like the muon, can change how the real particle interacts with the magnetic field, affecting its g-factor. Theoretical physicists have calculated, based on our current understanding of the fundamental structure of nature, all the ways that each known particle affects the muon's ...Read More...

New research could literally squeeze more power out of solar cells



Artists impression of squeezing more power out of solar cells by physically deforming each of the crystals in the semiconductors used by photovoltaic cells. Credit: University of Warwick/Mark Garlick

Physicists at the University of Warwick have today, Thursday 19th April 2018, published new research in the fournal Science today 19th April 2018 (via the Journal's First Release pages) that could literally squeeze more power out of solar cells by physically deforming each of the crystals in the semiconductors used by photovoltaic cells.

The paper entitled the "Flexo-Photovoltaic Effect" was written by Professor Marin Alexe, Ming-Min Yang, and Dong Jik Kim who are all based in the University of Warwick's Department of Physics.

The Warwick researchers looked at the physical constraints on the current design of most commercial solar cells which place an absolute limit on their efficiency. Most commercial solar cells are formed of two layers creating at their boundary a junction between two kinds of semiconductors, p-type with positive charge carriers (holes which can be filled by electrons) and n-type with negative charge carriers (electrons).

When light is absorbed, the junction of the two semiconductors sustains an internal field splitting the photo-excited carriers in opposite directions, generating a current and voltage across the junction. Without such junctions the energy cannot be harvested and the photo-exited carriers will simply quickly recombine eliminating any electrical charge.

That junction between the two semiconductors is fundamental to getting power out of such a solar cell but it comes with an efficiency limit. This Shockley-Queisser Limit means that of all the power contained in sunlight falling on an ideal solar cell in ideal conditions only a maximum of 33.7% can ever be turned into electricity.

There is however another way that some materials can collect charges produced by the photons of the sun or from elsewhere. The bulk photovoltaic effect occurs in certain semiconductors and insulators where ...Read More...

Meteoric Diamonds Are Evidence of Long Lost Planets

An artist's illustration of a protoplanet. Pavel Gabzdyl/Shutterstock

Diamonds found in meteorites on Earth may have come from an ancient long-dead planet the size of Mercury or Mars, the first potential known relics from these lost worlds, a new study finds.

Scientists examined a ureilite, a kind of meteorite that is rich in carbon and sometimes even possesses diamonds. More than 480 ureilites have been discovered so far, says study lead author Farhang Nabiei, a materials scientist and electron microscopist at the Swiss Federal Institute of Technology in Lausanne.

Meteoric Diamonds

Specifically, the researchers investigated the Almahata Sitta ureilite, which fell to Earth in 2008 in the Nubian Desert in Sudan. They analyzed diamonds within the ureilite that were a few dozen to a few hundred microns large. (In comparison, the average human hair is about 100 microns wide.)

Previous explanations for the diamonds within ureilites include powerful impacts, such as collisions between asteroids. The pressure from such impacts could have transformed graphite — the form of carbon often used in pencils — into gems. However, the large sizes of some diamonds found in ureilites hint that it may have taken more than the pressure of a cosmic impact to create them.

Now, using electron beams, Nabiei and his colleagues discovered crystalline particles made of iron and sulfur within diamonds in the Almahata Sitta ureilite. Called "inclusions", these particles are only found in diamonds formed under sustained high pressures of more than 20 gigapascals. Their presence suggests these diamonds arose within the crushing pressures found in the interior of a planet.

"We didn't expect to see these inclusions at all," Nabiei says.

Long Gone Planet

The researchers suggested that ureilites originated within a protoplanet somewhere between ..Read More...

Is dark matter made of primordial black holes?

The dwarf irregular galaxy IC1613. Astronomers wondering whether primordial black holes might compose the dark matter in the universe suggest that the shapes of faint dwarf galaxies with dark matter halos might reveal the answer. Credit: NASA/JPL-Caltech/SSC

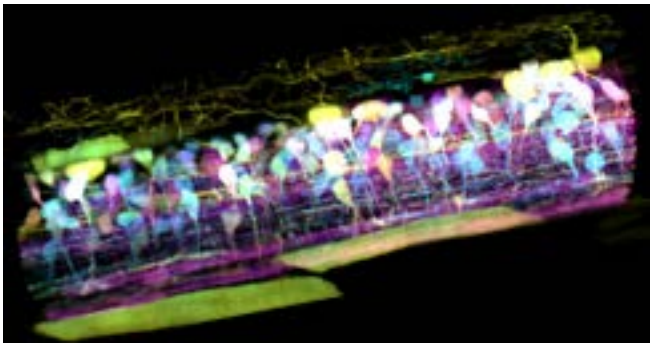
Astronomers studying the motions of galaxies and the character of the cosmic microwave background radiation came to realize in the last century that most of the matter in the universe was not visible. About 84 percent of the matter in the cosmos is dark matter, much of it located in halos around galaxies. It was dubbed dark matter because it does not emit light, but it is also mysterious: it is not composed of atoms or their usual constituents like electrons and protons.

Meanwhile, astronomers have observed the effects of black holes and recently even detected gravitational waves from a pair of merging black holes. Black holes usually are formed in the explosive death of massive stars, a process that can take many hundreds of millions of years as a star coalesces from ambient gas, evolves and finally dies. Some black holes are inferred to exist in the early universe, but there is probably is not enough time in the early universe for the normal formation process to occur. Some alternative methods have been proposed, like the direct collapse of primordial gas or processes associated with cosmic inflation, and many of these primordial black holes could have been made.

CfA astronomer Qirong Zhu led a group of four scientists investigating the possibility that today's dark matter is composed of primordial black holes, following up on previously published suggestions. If galaxy halos are made of black holes, they should have a different density distribution than halos made of exotic particles. There are some other differences as well—black hole halos are expected to form earlier in a galaxy's evolution than do some other kinds of halos.

The scientists suggest that looking at the stars in the halos of faint dwarf galaxies can probe these effects because dwarf galaxies are small and faint (they shine with a mere few thousand solar luminosities) where slight effects can be more easily spotted. The team ran a set of computer simulations to test whether dwarf galaxy halos might reveal the presence of primordial ..Read More...

New microscope captures detailed 3-D movies of cells deep within living systems



Inside the spinal cord of a zebrafish embryo, new neurons light up in different colors, letting scientists track nerve circuit development. Credit: T. Liu et al./Science 2018

Our window into the cellular world just got a whole lot clearer.

By combining two imaging technologies, scientists can now watch in unprecedented 3-D detail as cancer cells crawl, spinal nerve circuits wire up, and immune cells cruise through a zebrafish's inner ear.

Physicist Eric Betzig, a group leader at the Howard Hughes Medical Institute's Janelia Research Campus, and colleagues report the work April 19, 2018, in the journal Science.

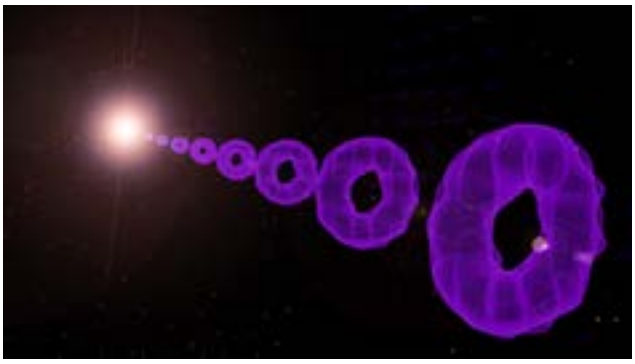
Scientists have imaged living cells with microscopes for hundreds of years, but the sharpest views have come from cells isolated on glass slides. The large groups of cells inside whole organisms scramble light like a bagful of marbles, Betzig says. "This raises the nagging doubt that we are not seeing cells in their native state, happily ensconced in the organism in which they evolved."

Even when viewing cells individually, the microscopes most commonly used to study cellular inner workings are usually too slow to follow the action in 3-D. These microscopes bathe cells with light thousands to millions of times more intense than the desert sun, Betzig says. "This also contributes to our fear that we are not seeing cells in their natural, unstressed form.

"It's often said that seeing is believing, but when it comes to cell biology, I think the more appropriate question is, 'When can we believe what we see?'" he adds.

To meet these challenges, Betzig and his team combined two microscopy technologies they first reported in 2014, the same year he shared the Nobel Prize in Chemistry. To unscramble the light from cells buried within organisms, the researchers turned to adaptive optics - the same technology used by astronomers to provide clear views of distant celestial objects through Earth's turbulent atmosphere. Then, to image the internal choreography of these cells quickly yet gently in 3-D, the team used lattice light sheet microscopy. That technology rapidly ...Read More...

Atoms may hum a tune from grand cosmic symphony



An expanding, ring-shaped cloud of atoms shares several striking features with the early universe. Credit: E. Edwards/JQI

Researchers playing with a cloud of ultracold atoms uncovered behavior that bears a striking resemblance to the universe in microcosm. Their work, which forges new connections between atomic physics and the sudden expansion of the early universe, was published April 19 in Physical Review X and featured in Physics.

"From the atomic physics perspective, the experiment is beautifully described by existing theory," says Stephen Eckel, an atomic physicist at the National Institute of Standards and Technology (NIST) and the lead author of the new paper. "But even more striking is how that theory connects with cosmology."

In several sets of experiments, Eckel and his colleagues rapidly expanded the size of a doughnut-shaped cloud of atoms, taking snapshots during the process. The growth happens so fast that the cloud is left humming, and a related hum may have appeared on cosmic scales during the rapid expansion of the early universe—an epoch that cosmologists refer to as the period of inflation.

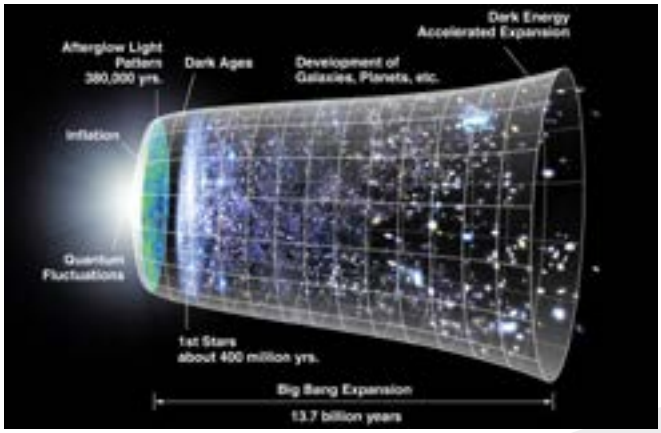
The work brought together experts in atomic physics and gravity, and the authors say it is a testament to the versatility of the Bose-Einstein condensate (BEC)—an ultracold cloud of atoms that can be described as a single quantum object—as a platform for testing ideas from other areas of physics.

"Maybe this will one day inform future models of cosmology," Eckel says. "Or vice versa. Maybe there will be a model of cosmology that's difficult to solve but that you could simulate using a cold atomic gas."

It's not the first time that researchers have connected BECs and cosmology. Prior studies mimicked black holes and searched for analogs of the radiation predicted to pour forth from their shadowy boundaries. The new experiments focus instead on the BEC's response to a rapid expansion, a process that suggests several analogies to what may have happened during the period of inflation.

The first and most direct analogy involves the way that waves travel through an expanding medium. .Read More...

Researchers find new way of exploring the afterglow from the Big Bang



This is an artist's concept of the metric expansion of space, where space (including hypothetical non-observable portions of the universe) is represented at each time by the circular sections. Note on the left the dramatic expansion (not to scale) occurring in the inflationary epoch, and at the center the expansion acceleration. The scheme is decorated with WMAP images on the left and with the representation of stars at the appropriate level of development. Credit: NASA

Researchers have developed a new way to improve our knowledge of the Big Bang by measuring radiation from its afterglow, called the cosmic microwave background radiation. The new results predict the maximum bandwidth of the universe, which is the maximum speed at which any change can occur in the universe.

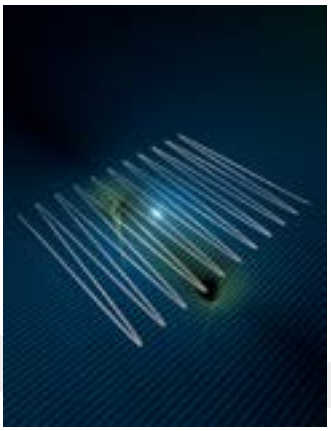
The cosmic microwave background (CMB) is a reverberation or afterglow left from when the universe was about 300,000 years old. It was first discovered in 1964 as a ubiquitous faint noise in radio antennas. In the past two decades, satellite-based telescopes have started to measure it with great accuracy, revolutionizing our understanding of the Big Bang.

Achim Kempf, a professor of applied mathematics at the University of Waterloo and Canada Research Chair in the Physics of Information, led the work to develop the new calculation, jointly with Aidan Chatwin-Davies and Robert Martin, his former graduate students at Waterloo.

"It's like video on the Internet," said Kempf. "If you can measure the CMB with very high resolution, this can tell you about the bandwidth of the universe, in a similar way to how the sharpness of the video image on your Skype call tells you about the bandwidth of your internet connection."

The study appears in a special issue of Foundations of Physics dedicated to the material Kempf presented to the Vatican Observatory in Rome last year. The international workshop entitled, Black Holes, Gravitational Waves and Spacetime Singularities, gathered 25 leading physicists from around the world to present, collaborate and inform on the latest theoretical progress and experimental data on the Big Bang. Kempf's invitation was the result of this paper in Physical Review Letters. ...Read More...

For the first time, researchers place an electron in a dual state—neither freed nor bound



Schematic illustration of the Kramers Henneberger potential formed by a mixture of the atomic potential and a strong laser field. Credit: UNIGE - Xavier Ravinet

Atoms are composed of electrons moving around a central nucleus to which they are bound. The electrons can also be torn away via the powerful electric field of a laser, overcoming the confining force of their nucleus. A half-century ago, the theorist Walter Henneberger wondered if it were possible to use a laser field to free an electron from its atom without removing it from the nucleus. Many scientists considered it to be impossible. However, it has now been successfully confirmed by physicists from the University of Geneva (UNIGE), Switzerland, and the Max Born Institute (MBI) in Berlin, Germany.

For the first time, researchers controlled the shape of the laser pulse to keep an electron both free and bound to its nucleus, and were at the same time able to regulate the electronic structure of the atom. What's more, they also made these unusual states amplify laser light and identified a no-go area. In this area, nicknamed "Death Valley," the physicists lost all their power over the electron. These results shatter the usual concepts related to the ionisation of matter. The results have been published in the journal Nature Physics.

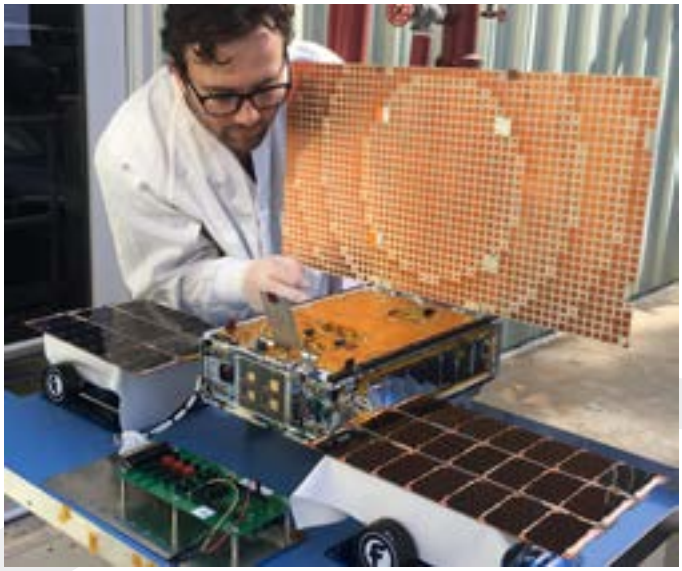
Henneberger's hypothesis proposed that if an electron were trapped in the laser, it would be forced to pass back and forth in front of its nucleus, and would thus be exposed to the electric field of both the laser and the nucleus. This dual state would make it possible to control the motion of electrons exposed to both electric fields, and would let the physicists create atoms with a new electronic structure tunable with light.

Leveraging the natural oscillations of the electron

The more intense a laser is, the easier should it be to ionise the atom—in other words, to tear the electrons away from the attracting electric field of their nucleus and free them into space. "But once the atom ...Read More...

Special Read:

NASA engineers dream big with small spacecraft



Engineer Joel Steinkraus uses sunlight to test the solar arrays on one of the Mars Cube One (MarCO) spacecraft at NASA's Jet Propulsion Laboratory. Credit: Jet Propulsion Laboratory

Many of NASA's most iconic spacecraft towered over the engineers who built them: think Voyagers 1 and 2, Cassini or Galileo—all large machines that could measure up to a school bus.

But in the past two decades, mini-satellites called CubeSats have made space accessible to a new generation. These briefcase-sized boxes are more focused in their abilities and have a fraction of the mass—and cost—of some past titans of space.

In May, engineers will be watching closely as NASA launches its first pair of CubeSats designed for deep space. The twin spacecraft are called Mars Cube One, or MarCO, and were built at NASA's Jet Propulsion Laboratory in Pasadena, California.

Both MarCO spacecraft will be hitching a ride on the same rocket launching InSight, NASA's next robotic lander headed for Mars. The MarCOs are intended to follow InSight on its cruise through space; if they survive the journey, each is equipped with a folding high-gain antenna to relay data about InSight as it enters the Martian atmosphere and lands.

The MarCOs won't produce any science of their own, and aren't required for InSight to send its data back home (the lander will rely on NASA's Mars orbiters for that, in addition to communicating directly with antennas on Earth). But the twins will be a crucial first test of CubeSat technology beyond Earth orbit, demonstrating how they could be used to further explore the solar system.

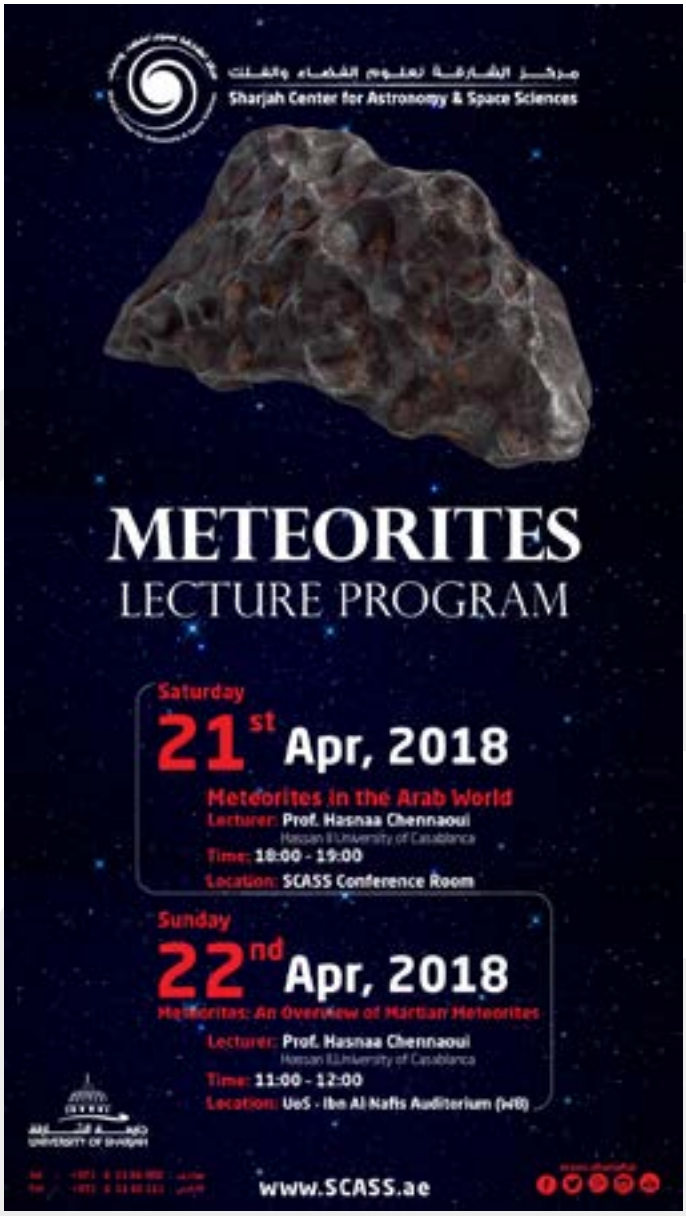
"These are our scouts," said Andy Klesh of JPL, MarCO's chief engineer. "CubeSats haven't had to survive the intense radiation of a trip to deep space before, or use propulsion to point their way towards Mars. We hope to blaze that trail."

The official names of these two scouts are "MarCO-A" and "MarCO-B." But to the team that built them, they're "Wall-E" and "Eva"—nicknames based on Pixar characters. Both MarCOs use a compressed gas commonly found in fire extinguishers to push themselves through space, the same way Wall-E did in his 2008 film.

Survival is far from guaranteed. As the saying goes: space is hard. The first challenge will be switching on. The MarCO batteries were last checked in March by Tyvak Nano-Satellite Systems of Irvine, California, which inserted each CubeSat into a special dispenser that will propel it into space. Those batteries will be used to deploy each CubeSat's solar arrays, with the hope that enough power will be left over to turn on their radios. If power is too low, the MarCO team may hear silence until each spacecraft is more fully charged.

If both MarCOs make the journey, they'll test a method of communications relay that could act as a "black box" for future Mars landings, helping engineers understand the difficult process of getting spacecraft to safely touch down on the Red Planet. Mars landings are notoriously hard to stick. ...Read More...

Special SCASS Lecture:
Meteorites in the Arab World
Prof. Hasnaa Chennaoui
Apr. 21 - 22, 2018



This Week's Sky at a Glance
Apr. 21-27, 2018

Apr 21	Sa	11:38	Moon North Dec.: 20.4° N
Apr 22	Su	21:49	Lyrid Shower: ZHR = 20
Apr 23	Mo	01:46	First Quarter
		10:17	Moon-Beehive: 2° N
		16:19	Moon Ascending Node
Apr 24	Tu	20:47	Venus-Pleiades : 3.5° S
		23:39	Moon-Regulus: 1.2° S

The Meteor Shower Report: Lyrids Showers 2018

For enthusiastic meteor watchers, it has been a long stretch – nearly 16 weeks– since there has been a decent opportunity to catch sight of a reasonably good meteor shower. There are 10 displays during the year that are generally considered reliable and worth looking for, and the most recent of these, the Quadrantid meteors, peaked in early January. Since then, we've gone through the rest of winter and into the first full month of spring with not much in the way of significant meteor activity.

That drought will come to an end this weekend for viewers in the Northern Hemisphere, with the appearance of one of the oldest known meteor showers.

The meteors are called "Lyrids" because their paths, if extended backward, appear to diverge from a spot in the sky about 9 degrees to the lower right of the brilliant bluish-white star Vega, in the constellation Lyra, the lyre. To give you a good idea of how far that is, your clenched fist held at arm's length measures 10 degrees. Within a day on either side of the maximum, about five to 10 Lyrids can usually be seen each hour by a single observer under good skies. At the peak, which comes early Sunday morning, the Lyrid rate will be roughly 10 to 20 per hour.

Vega will appear to rise from the northeast around 9 p.m. local daylight time, but by 4 a.m., it will have climbed to a point in the sky nearly overhead. You might want to lie down on a long lounge chair where you can get a good view of the sky, and be sure to give your eyes plenty of time to adjust to the dark. Bundle up, too, if you're somewhere where the weather's not yet summery; while it probably won't be as cold as on a winter evening, nights (and especially early mornings) in April can still be quite chilly in many areas.

While hardly a rich display like the famous August Perseids or December Geminids, the April Lyrids are brilliant and appear to move fairly fast, appearing to streak through our atmosphere at 30 miles per second (50 kilometers per second). About 20 to 25 percent of these meteors leave persistent trains. Their orbit follows that of Comet Thatcher, which appeared in 1861 and has an orbital period of about 400 years. Earth's orbit nearly coincides with Comet Thatcher's around April 22 each year. When Earth passes that part of its orbit, we ram through the dusty debris left behind by the comet.

Thus, the Lyrids are this comet's legacy; they represent the tiny bits and pieces shed by this comet on previous visits to the sun. None of us, of course, has any chance of seeing this comet's return engagement with the sun in the 2200s, but we will certainly be able to enjoy the sight of tiny bits and pieces that broke off its nucleus hundreds or thousands of years ago, blazing through our atmosphere in a fiery flash to create the effect of "shooting stars."

An ancient meteor shower

The Lyrid meteor shower has been observed for more than 2,600 years; Chinese records say "stars fell like rain" in the shower of 687 B.C. Skywatchers have witnessed quite spectacular displays at least a dozen times since. On April 20, 1803, residents of Richmond, Virginia, after being roused out of bed by a fire bell, were surprised to see great numbers of meteors in all parts of the sky.

In 1922, an unexpected Lyrid rate of 96 meteors per hour was recorded, and in 1982, rates unexpectedly reached 80 per hour. Although the Lyrids usually provide a weak display, they have a history of surprising observers – so it's always one to watch.

One final note: While the moon will arrive at first-quarter phase on April 22, it will have set by 2 a.m. on Sunday, leaving the sky dark and moonless for at least 2 and a half hours before the first light of dawn, providing a good backdrop for viewing this faithful meteor display. ...Read More...