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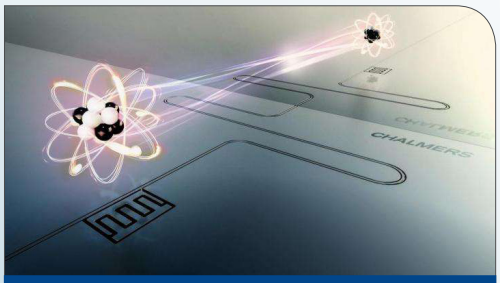
S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

Team extends the lifetime of atoms using a mirror

PhysOrg.com, 13OCT2015



The lifetime of an atom can be extended up to ten times by placing it in front of a short circuit that acts as a mirror. The artificial atom consists of a superconducting circuit on a silicon chip. Credit: Moa Carlsson and Lisa Kinnerud, Krantz NanoArt

An international team of researchers (Sweden, USA - UC Santa Barbara, Taiwan, Japan, Canada) placed an artificial atom at a specific distance in front of a short circuit that acts as a mirror. The atom interacts with its mirror image, which changes the amount of vacuum fluctuations to which the atom is exposed. By changing the distance to the mirror, they can get the atom to live longer, up to ten times as long as if the mirror had not been there. TECHNICAL ARTICLE

Tags: Breakthrough technology, Particle physics, Featured Article

Scientists paint quantum electronics with beams of light

PhysOrg.com, 09OCT2015

A team of researchers in the US (University of Chicago, UC Santa Barbara, Pennsylvania State University) reports the discovery of an optical effect that allows them to "tune" the energy of electrons in topological materials using light, and without ever having to touch the material itself. They have used it to draw and erase p-n junctions—one of the central components of a transistor—in a topological insulator for the first time. TECHNICAL ARTICLE

Tags: Quantum science, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

Bionanotechnologists create microchannels with 3D printing (w/video)

Nanowerk, 08OCT2015

An international team of researchers (the Netherlands, Spain) has developed a new, inexpensive way to make microfluidic devices without using costly materials or clean room facilities. The technique can be used to build an organ-on-a-chip and offers new possibilities for researchers. TECHNICAL ARTICLE

Tags: Advanced manufacturing

ADVANCED MATERIALS

Blooming microflowers open new electronic frontiers

Science Daily, 30OCT2015

To create the microflowers, an international team of researchers (India, Australia), mixed two organic components (NDI-bearing phosphonic acid and melamine) in water, then evaporated it. The artificial microflowers, about 10 microns wide, take about three hours to fully develop, mimicking the way natural flowers bloom. They have potential for applications in a range of fields—from optoelectronics and chemosensors to nanotechnology, biotechnology, biomedicine and organic electronics. TECHNICAL ARTICLE

Tags: Advanced materials

The second semiconductor revolution

MIT News, 08OCT2015

At the Materials Day meeting (October 14) speakers will present their latest insights into applying quantum phenomenon to understanding basic science, developing new materials and creating new computers, sensors, energy and communication devices. The beauty of these materials is that they are extreme; there is nothing thinner, there is nothing stronger. We are starting the semiconductor revolution again. We have a 40-, 50-year run in front of us to take full advantage of these new materials and the new generation of circuits

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and microsystems that these materials enable.
Tags: Advanced materials, Materials science

Disappearing carbon circuits on graphene could have security, biomedical uses

Science Daily, 30SEP2015

Using carbon atoms deposited on graphene with a focused electron beam process, a team of researchers in the US (Georgia Institute of Technology, AFRL, Wright Patterson AFB) has demonstrated a technique for creating dynamic patterns on graphene surfaces. The patterns could be used to make reconfigurable electronic circuits, which evolve over a period of hours before ultimately disappearing into a new electronic state of the graphene. TECHNICAL ARTICLE
Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Robot Phone, Cardboard Karts, and The Long Road to Everywhere

IEEE Spectrum, 09OCT2015

For the last several years, Harvard University has been developing a robot bee. Their sub-paper-clip-sized, 100-milligram flapping-wing micro aerial vehicle is fully controllable down to a stable autonomous hover. It is still tethered for power, and there's no on-board autonomous control, but the robot flaps its wings and flies like an insect.
Tags: Autonomous systems & robotics

A computer algorithm that copies the navigation functionality of humans and animals helps robots navigate unfamiliar spaces.

ResearchSea, 07OCT2015

The human navigation function is operated by two types of brain cells—place cells and grid cells. Researchers in Singapore have implemented the same neural scheme for robots, using computer programs that simulate the activity of place and grid cells in the brain. Crucial to the computational algorithm is the strength of the feedback mechanism between the grid cells and place cells, and the calibration of the visual signals is integral to the map building process of the computer algorithm. TECHNICAL ARTICLE
Tags: Autonomous systems & robotics

BIG DATA

New tool: How to get meaningful information out of big data

Science Daily, 13OCT2015

Computer programs use clustering to group together objects which share common traits. But clustering is a complicated way to work. An international team of researchers (Denmark, Germany) created a tool called ClustEval that can provide an objective overview of all available cluster tools, so that researchers get an unbiased, objective overview and suggestions as to what tool to use with what parameters in which setting. TECHNICAL ARTICLE
Tags: Big data

New programming approach seeks to make large-scale computation more reliable

PhysOrg.com, 08OCT2015

Today's circuitry is so small that it's brushing up against the limits of quantum mechanics. Researchers at the University of Chicago have developed a concept called Global View Resilience—not designed so much to prevent errors as to allow a program to recover from them. GVR enables applications to not only save the work underway; it also enables flexible error checking and allows the program to fix itself while still in operation. Applications can even specify which parts of a computation are more important than others and which need more care.
Tags: Big data, Information technology

ENERGY

Iron-gallium alloy shows promise as a power-generation device

PhysOrg.com, 29OCT2015

A team of researchers in the US (UCLA, University of North Texas, AFRL, Eglin AFB) has shown that Galfenol can generate as much as 80 megawatts of instantaneous power per square meter under strong impacts. Unlike the explosively driven ferromagnetic pulse generator which destroys the ferromagnet even as it produces power, Galfenol devices can be used repeatedly and cyclically. TECHNICAL ARTICLE
Tags: Energy, Materials science

FORECASTING

Gartner identifies the top 10 strategic IT technology trends for 2016

KurzweilAI, 08OCT2015

At the Gartner Symposium/ITxpo on Oct. 8, Gartner, Inc. highlighted the top 10 technology trends that will be strategic for most organizations in 2016 and will shape digital business opportunities through 2020. These trends include: The Device Mesh, Ambient User Experience, 3D Printing Materials, Information of Everything, Advanced Machine Learning, Autonomous Agents and Things, Adaptive Security Architecture, Advanced System Architecture, Mesh App and Service Architecture, and Internet of Things Platforms.
Tags: Forecasting, Information technology

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"The most incomprehensible thing about our universe is that it can be comprehended."

ALBERT EINSTEIN

IMAGING TECHNOLOGY

Breakthrough for photography: Light sensing technology

Science Daily, 29OCT2015

Quanta Image Sensor (QIS), developed by researchers at Dartmouth College, counts photons. They were able to build a new kind of pixel with sensitivity so high they could see one electron above all the background noise. The new pixels are able to sense and count a single electron for the first time, without resorting to extreme measures, such as cooling the sensor to -60 C and/or avalanche multiplication. Low-light sensitivity is particularly important in applications such as security cameras, astronomy, or life science imaging. TECHNICAL ARTICLE

Tags: Imaging technology, Photonics

Light-optics research could improve medical imaging

PhysOrg.com, 13OCT2015

Researchers in Australia developed a method which allows waves of light, sound or radio to travel through complex obstacles, which would usually scatter the wave, yet have the entire wave arrive at once at its point of destination. The technique could be applied to any application where a signal is sent through a complex medium without being distorted by "echoes." It may lead to new uses within the medical industry. TECHNICAL ARTICLE

Tags: Imaging technology, Photonics, S&T Australia

INFORMATION TECHNOLOGY

Data storage of the future: Scientists crack secret of making stable, dynamic skyrmions

Science Daily, 13OCT2015

An international team of researchers (China, Sweden, Ireland, Switzerland) showed that a magnetic skyrmion can be created under a nanocontact in which a spin-polarized current is injected into the magnetic thin film providing a spin torque to its magnetic moments. Once created, they can be stabilized and transported over distances of several hundred nanometers. Skyrmions can be created and manipulated in materials that have never before been considered for skyrmionics. TECHNICAL ARTICLE

Tags: Information Technology, Materials science

MATERIALS SCIENCE

Researchers design material that more effectively slows light

Nanowerk, 07OCT2015

Researchers at the University of Alabama designed and made a material that manipulates the speed of light in a new, more effective way than previous methods. They fabricated and measured subwavelength metal patterns that were specially designed on top of a substrate, such as silicon. Slow light will lead to the development of optical buffers and delay lines as essential elements of future ultrafast all optical communication networks. TECHNICAL ARTICLE

Tags: Materials science, Photonics

MICROELECTRONICS

Electronics get a power boost with the addition of simple material

Nanowerk, 09OCT2015

Researchers at Pennsylvania State University report for the first time the growth of thin films of vanadium dioxide on 3-inch sapphire wafers with a perfect 1:2 ratio of vanadium to oxygen across the entire wafer. The material can be used to make hybrid field effect transistors, called hyper-FETs, which could lead to more energy efficient transistors. They showed that the addition of vanadium dioxide provided steep and reversible switching at room temperature, reducing the effects of self-heating and lowering the energy requirements of the transistor. TECHNICAL ARTICLE 1, 2

Tags: Microelectronics

Scientists float new approach to creating computer memory

PhysOrg.com, 08OCT2015

A team of researchers in the US (UC Davis, NIST, University of Maryland, Lawrence Berkeley National Laboratory, UC Santa Cruz) has developed a straightforward method that creates magnetic skyrmions under ambient room conditions. Skyrmions possess an elasticity that protects them from outside influence, meaning the data they store would not be corrupted easily, even by stray magnetic fields or physical defects within the material. As a result, magnetic skyrmions present a promising basis for information memory systems and other nanoelectronic devices. TECHNICAL ARTICLE

Tags: Microelectronics, Information technology

'Performance cloning' techniques to boost computer chip memory systems design

Science Daily, 30SEP2015

Researchers at North Carolina State University have developed software using two new techniques to help computer chip designers improve memory systems. The techniques rely on "performance cloning," which can assess the behavior of software without compromising

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privileged data or proprietary computer code. TECHNICAL ARTICLE 1, 2

Tags: Microelectronics, Information technology

NEUROSCIENCE

Brain scans pinpoint individuals from a crowd

Nature News, 12OCT2015

Researchers at Yale University report that in some regions of the brain most people's neural circuitry connects up in similar ways. But patterns of connectivity in other brain regions, such as the frontal lobes, seem to differ between individuals. The variations in connectivity patterns also correlate with a person's performance on an intelligence test. That does not mean that a person's smarts can be deduced from a brain scan, but the uniqueness seems to be tied to cognitive function in some way. TECHNICAL ARTICLE

Tags: Neuroscience

Featured Resource

Science X

Science X covers physics, earth science, medicine, nanotechnology, electronics, space, biology, chemistry, computer sciences, engineering, mathematics and other sciences and technologies.

PHOTONICS

Nanoplasmonics makes the impossible possible

Nanowerk, 13OCT2015

For a long time it has been deemed impossible to combine light and magnetism because of a frequency gap where light moves 10,000 times faster than magnetism reacts, which means they cannot be integrated. Researchers in Sweden want to create strong interaction between light and magnetic fields and determine ways to control light with magnetism on the nanoscale. The entire field is still fairly unknown, and they are one of only a few research teams in the world currently looking specifically into light as nanoplasmonic resonances combined with magnetic nanostructures.

Tags: Photonics, S&T Sweden

Crystal clear: Thousand-fold fluorescence enhancement in an all-polymer thin film

Science Daily, 30SEP2015

An international team of researchers (Australia, China) discovered that a double heterostructure tri-layer of Colloidal Photonic Crystal (CPhC) resulted in a thousand-fold fluorescence enhancement in an all-polymer structure compared to that achieved by the same amount of dyes on glass substrate. The discovery could drive the next advances in sensor technology, energy saving and harvesting, lasers and optoelectronics. TECHNICAL ARTICLE

Tags: Photonics

QUANTUM SCIENCE

A quantum simulator of impossible physics

PhysOrg.com, 08OCT2015

An international team of researchers (China, Germany, Spain) reproduced in the lab the theoretical proposal that a trapped atom can display behaviour that is incompatible with the fundamental laws of quantum physics. More specifically, it deals with operations prohibited in microscopic physical systems such as charge conjugation, which transforms a particle into an antiparticle, or time reversal. TECHNICAL ARTICLE

Tags: Quantum science

New way of retaining quantum memories stored in light

PhysOrg.com, 30SEP2015

Researchers in China have developed a way to confine light which allows quantum memories stored within photons to be retained. The results may herald the advent of a multitude of hybrid, optoelectronic devices relying on the use of quantum information stored in photons for processing information that can be used in communication networks or quantum computing. TECHNICAL ARTICLE

Tags: Quantum science

Roadmap for Emerging Materials for Spintronic Device Applications

arXiv, 30SEP2015

In this roadmap exercise, an international team of researchers (UK, Japan, USA - State University of New York) and industry partners have targeted magnetic tunnel and spin-valve junctions as spintronic devices. These can be used as a cell for a magnetic random access memory and spin-torque oscillator in their vertical form as well as a spin transistor and a spin Hall device in their lateral form. TECHNICAL ARTICLE

Tags: Quantum science, Microelectronics

S&T POLICY

China's J31 stealth fighter specifications were revealed online

Next Big Future, 09OCT2015

The J-31 is a mid-weight, twin rudder and twin-engine jet with the typical configuration that is commonly shared by other 5th generation fighters such as Sukhoi T-50. J-31 incorporates certain stealth characters such as forward swept intake ramps with diverterless supersonic inlet (DSI) bumps, trapezoidal wings and a two-piece canopy. The J-31 appears to be a smaller and more agile aircraft than the Chengdu J-20

continued...

that resembles a twin engine F-35C. The data posted online describes the FC-31 as "designed for high survivability, low radar detectability, low IR signature, and excellent capabilities for electronic counter measures".

Tags: S&T policy, Military technology, S&T China

SCIENCE WITHOUT BORDERS

Nobel Prizes 2015

NobelPrize.org , 11OCT2015

Nobelprize.org provides comprehensive, first-hand information about the Nobel Prize and Nobel Laureates in Physics, Chemistry, Physiology or Medicine, Literature and Peace starting in 1901, as well as the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel and the Economics Laureates starting in 1969.

Tags: Science without borders

Explore 100 years of general relativity

New Scientist, 07OCT2015

In a century, Einstein's theory has revolutionised our picture of the universe. The article takes a look at the pivotal moments in general relativity since Einstein presented his theory in 1915.

Tags: Science without borders

On the Edge of Automation

MIT Technology Review, 28SEP2015

Five hundred years from now, says venture capitalist Steve Jurvetson, less than 10 percent of people on the planet will be doing paid work, everyone is going to be involved in some kind of information or entertainment. There will be no farmers, there will be no people working in manufacturing. There are more and more entrepreneurs all the time that think big. The ones who succeed will change the world.

Tags: Science without borders, Forecasting

SENSORS

A stretchable far-field communication antenna for wearable electronics

Nanowerk, 09OCT2015

To complement existing designs for stretchable antenna systems, an international team of researchers (Saudi Arabia, USA - University of Illinois at Urbana–Champaign) demonstrates a stretchable and wearable antenna that can provide a single frequency operation while flexing or stretching. The flexible and stretchable metal thin-film (copper) antenna for far-field communication—up to 80 meters while mounted on a stretchable fabric and worn by a person—maintains its properties during stretching, bending and strain cycles. TECHNICAL ARTICLE

Tags: Sensors, Flexible electronics

Using optical fiber to generate a two-micron laser

PhysOrg.com, 09OCT2015

Researchers in Switzerland have found a way to design two-micron lasers by changing the way optical fibres are connected to each other. With the new configuration, they were able not only to produce very good 2 micron lasers, but also to do without an expensive and complex component that is normally required. Two-micron spectral domain has potential applications in medicine, environmental sciences and industry. It is also useful for detecting key meteorological data over long distances through the air.

Tags: Sensors, Photonics

Hybrid Spintronic-CMOS Spiking Neural Network With On-Chip Learning: Devices, Circuits and Systems

arXiv, 01OCT2015

Researchers at Purdue University propose a spintronic synapse with decoupled spike transmission and programming current paths. The spintronic synapse consists of a ferromagnet-heavy metal heterostructure where programming current through the heavy metal generates spin-orbit torque to modulate the device conductance. The researchers demonstrate the interfacing of such spintronic synapses with CMOS neurons and learning circuits operating in transistor sub-threshold region to form a network of spiking neurons that can be utilized for pattern recognition problems. TECHNICAL ARTICLE

Tags: Sensors, Pattern recognition ■

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