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S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Advanced manufacturing (1)
Advanced materials (6)
Autonomous systems & robotics (1)
Big data (1)
Biotechnology (5)
Communications technology (1)
Cyber security (1)
Energy (3)
Forecasting (1)
Imaging technology (2)
Information technology (1)
Materials science (1)
Microelectronics (2)
Neuroscience (1)
Quantum science (2)
S&T policy (2)
Science without borders (1)
Sensors (2)

FEATURE ARTICLES

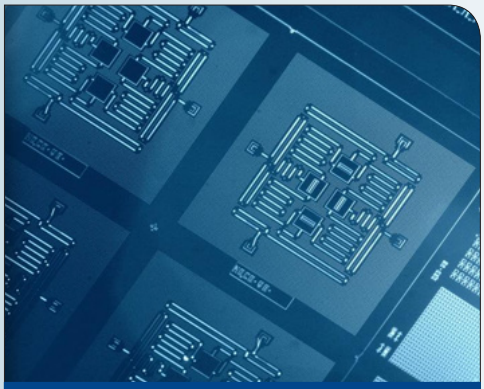
Zooming in

UC Santa Barbra, 30APR2015

An international team of researchers (USA, Germany) has for the first time been able to detect the frequency of radiation emitted by an individual, orbiting electron. One of the reasons the result is exciting is that it gives us a new way of capturing electrons to use as a back door into studying neutrinos. It may lead to a measurement of the neutrino mass, which is currently one of the last remaining unknowns in the Standard Model of particle physics. TECHNICAL ARTICLE

Tags: Science without borders, Particle physics, Featured Article

IBM Shows Off a Quantum Computing Chip



When cooled down to a fraction of a degree above absolute zero, the four dark elements at the center of the circuit in the middle of this image can represent digital data using quantum mechanical effects.

MIT Technology Review, 29APR2015

IBM's new chip is the first to integrate qubits into a 2-D grid. The circuits are made from metals that become superconducting when cooled to extremely low temperatures. The chip contains only the simplest grid possible, four qubits in a two-by-two array. Researchers think one of the best routes to making a practical quantum computer would involve creating grids of hundreds or thousands of qubits working together. The chip operates at only a fraction of a degree above absolute zero. TECHNICAL ARTICLE

Tags: Microelectronics, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

An introduction to printed flexible sensors

IDTechEx, 04MAY2015

In most cases printed sensors can be made on plastic substrates, offering the advantages of mechanical flexibility, thinness and light weight. This presentation explains the evolution of the technology and shows some of the latest examples of printed sensors.

Tags: Advanced manufacturing, Sensors

ADVANCED MATERIALS

Theorists show environments can alter 2-D materials' basic properties

PhysOrg.com, 04MAY2015

Researchers at Rice University calculated that atomically thin layers of molybdenum disulfide can take on the qualities of plastic through exposure to a sulfur-infused gas at the right temperature and pressure. It may be possible to tune the plasticity of dichalcogenides in general. It may also be possible to eliminate the defects from a 2-D dichalcogenide sheet by allowing the dislocations to rapidly diffuse away and vanish or to form interesting aggregated states. TECHNICAL ARTICLE

Tags: Advanced materials

Hybrid nanostructures: a novel way to control domain walls

Nanotechweb, 01MAY2015

An international team of researchers (Brazil, Chile, Germany) propose an alternative, simpler method for domain wall injection into cylindrical nanostructures. Cylindrical tubes have advantages over the more common magnetic wires studied for data storage media, spintronic devices and even biomedical applications. TECHNICAL ARTICLE

Tags: Advanced materials

continued...

BACK TO TOP

New coating material embeds anti-smudge polymer chains in graft-copolymer micelles

PhysOrg.com, 01MAY2015

Researchers in Canada have developed a novel approach, taking advantage of the self-assembling properties of a graft copolymer made up of a backbone containing many hydroxyl groups (polyol) and side chains consisting of a fluorinated polymer oil. A coating based on these micelles has constant surface properties, even after extensive wear. TECHNICAL ARTICLE

Tags: Advanced materials, Materials science

Researchers enhance nonlinear effects of optical metasurfaces

PhysOrg.com, 01MAY2015

In their review article, an international team of researchers (Australia, Russia) introduces the basic concepts, sums up important historical aspects, and gives an overview of the most interesting properties of photonic metasurfaces, demonstrating their useful functionalities such as frequency selectivity, wavefront shaping, and polarization control. They discuss ways to achieve tunability of metasurfaces and demonstrate that nonlinear effects can be enhanced with the help of metasurface engineering.

Tags: Advanced materials, Materials science

Desirable defects in liquid crystals

Nanowerk, 30APR2015

An international team of researchers (Italy, UK) report that introducing flaws into liquid crystals by inserting microspheres and then controlling them with electrical fields is a method that could be exploited for a new generation of advanced materials, potentially useful for optical technologies, electronic displays and e-readers. TECHNICAL ARTICLE

Tags: Advanced materials

Chemists strike nano-gold: Four new atomic structures for gold nanoparticle clusters

Science Daily, 28APR2015

Researchers at the University of Nebraska have developed nanoscale blueprints for low-energy, stable gold nanoclusters. Knowing the nanoparticle's most stable configurations could allow biomedical engineers to identify appropriate binding sites for drugs used to treat cancer and other diseases. The findings could also optimize the use of gold nanoparticles in catalyzing the oxidation process that transforms dangerous carbon monoxide emissions into the less noxious carbon dioxide. TECHNICAL ARTICLE

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Strong Microbots, Holographic Robots, and Extreme Drone Flying

IEEE Spectrum, 01MAY2015

Parts of Syria are cut off from aid by fighting. Starvation of food and medical supplies has become a brutal weapon of war. Devastated that this could be allowed to happen, a team of volunteers in America are trying to develop drones to get to places that humans and airlifts can't.

Tags: Autonomous systems & robotics

BIG DATA

New mathematical logic could have averted the attack on Saddam

PhysOrg.com, 05MAY2015

The new form of intelligence analysis proposed by researchers in Sweden is based on subjective logic. This type of logic can explicitly handle degrees of uncertainty, and this produces intelligence analysis models that are far more realistic than those produced by current interpretation methods. With the aid of subjective logic, the certainty and uncertainty of all probability estimates can be quantified.

Tags: Big data, S&T Sweden

BIOTECHNOLOGY

3D graphene makes biocompatible scaffolds

Nanotechweb, 01MAY2015

Researchers at Northwestern University have printed the first biocompatible 3D graphene-based composite from liquid ink. It is strong and flexible with electrical conductivities of 800 S/m, which is 10 times higher than previously reported values for 3D printed carbon materials. The composite also appears to help regenerate damaged nerve and cardiac tissue—without the need for added neurogenic factors or other external stimuli. It could thus be ideal in complex tissue engineering, implantable electronics and biosensors. TECHNICAL ARTICLE

Tags: Biotechnology, Advanced materials

Flowing against the stream: Inanimate beads behave in lifelike ways

Science Daily, 01MAY2015

An international team of researchers (USA, France) has created microbe-sized beads that can utilize energy in the environment to self-propel upstream by purely physical means. Living systems change their behavior according to their environment. The idea was to design a particle that can sense its environment with no neural system or biological parts. TECHNICAL ARTICLE

Tags: Biotechnology

continued...

"Nothing is less predictable than the development of an active scientific field."

CHARLES RICHTER

Unveiling of the world's smallest and most powerful micro motors

PhysOrg.com, 01MAY2015

Researchers in Japan have built a prototype micro ultrasonic motor using a stator with a volume of approximately one cubic millimeter. Their experiments have shown that the prototype motor generates a torque of more than 10 μNm with a one cubic millimeter stator. This novel motor is now the smallest micro ultrasonic motor that has been developed with a practical torque.

Tags: Biotechnology, S&T Japan

Breakthrough in 3-D printing of replacement body parts

PhysOrg.com, 29APR2015

An international team of researchers (the Netherlands, Australia, UK, Germany, USA) found a way to reinforce soft hydrogels via a 3D printed scaffold structure so that their stiffness and elasticity are close to that of cartilage tissues. They introduced organised, high-porosity microfiber networks that are printed using a new technique called "melt electrospinning writing." TECHNICAL ARTICLE

Tags: Biotechnology

Nanowire networks can hardwire adaptability

Nanotechweb, 29APR2015

An international team of researchers (USA, Japan, UK) has come up with a design strategy to make and study networks of billions of interacting nanowires using a combination of top-down and bottom-up fabrication and traditional electronic measurement technology. The nanowires are adapted to behave like neural synapses and the emergent characteristics of the networks are analogous to adaptability and memory, with possible applications in alternative types of computing. TECHNICAL ARTICLE

Tags: Biotechnology, Neuroscience

COMMUNICATIONS TECHNOLOGY

G5: Moving to the next generation in wireless technology

Science Daily, 30APR2015

An international team of researchers (UK, China) has completed a global review of 5G progress, including challenges that lie ahead. In their review they report that greater breakthroughs in wireless communication technology are on the way as research and development work continues to meet the commercial goal of 5G for all by 2020. They introduce potential techniques for future 5G systems. TECHNICAL ARTICLE

Tags: Communications Technology

CYBER SECURITY

Research advances security and trust in reconfigurable devices

PhysOrg.com, 29APR2015

Because FPGAs are programmable and they tightly couple software and hardware interfaces, there's concern they may introduce a whole new class of vulnerabilities compared to other microelectronic devices. Researchers at the Georgia Institute of Technology are investigating ways in which hackers might gain the critical knowledge necessary to compromise a chip. They are developing multiple techniques to provide assurance in programmable logic designs.

Tags: Cyber security

ENERGY

For batteries, one material does it all

PhysOrg.com, 04MAY2015

The new material used by researchers at the University of Maryland, consists of a mix of sulfur, germanium, phosphorus and lithium. This compound is used as the ion-moving electrolyte. Carbon is added at each end of the electrolyte to form electrodes that push the ions back and forth through the electrolyte as the battery charges and discharges. TECHNICAL ARTICLE

Tags: Energy, Battery

Wireless power transfer enhanced by metamaterials

PhysOrg.com, 30APR2015

Researchers in China have experimentally demonstrated a way to improve the efficiency of wireless power transfer by using magnetic metamaterials. The new method improves the efficiency of the design from a few percent to nearly 20% at a distance of 4 cm, which could pave the way toward new applications, including wireless charging of implanted pacemakers and electric vehicles. TECHNICAL ARTICLE

Tags: Energy, S&T China

Tracking exploding lithium-ion batteries in real-time

Science Daily, 28APR2015

An international team researchers (UK, France) observed changes to the internal structure and external temperature of two types of Li-ion batteries as they exposed them to extreme levels of heat. The battery with an internal support remained largely intact up until the initiation of thermal runaway, at which point the copper material

continued...

inside the cell melted indicating temperatures up to ~1000 degrees C. This heat spread from the inside to the outside of the battery causing thermal runaway. In contrast, the battery without an internal support exploded causing the entire cap of the battery to detach and its contents to eject. TECHNICAL ARTICLE

Tags: Energy, Battery

FORECASTING

Top 10 Emerging Technologies of 2015

Next Big Future, 01MAY2015

The World Economic Forum's Meta-Council on Emerging Technologies, a panel of 18 experts, draws on the collective expertise of the Forum's communities to identify the most important recent technological trends.

Tags: Forecasting, Emerging technology

Featured Resource

Live Science

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IMAGING TECHNOLOGY

Disney Research algorithm combines videos from unstructured camera arrays into panoramas

EurekAlert, 04MAY2015

Researchers at Disney in Switzerland have demonstrated their technique using as many as 14 various types of cameras, generating panoramic video in the order of tens to more than 100 megapixels. They foresee a day when just about anyone could create a high-quality video panorama by setting up a few video cameras or even linking several smartphones, just as many people today can easily create a still photo panorama with their smartphones.

Tags: Imaging technology

Portable 'battlefield MRI' comes out of the lab

Physics World, 30APR2015

To scale down the scanners, researchers at Los Alamos National Laboratory have made use of ultralow magnetic fields, which have intensities comparable to that of the Earth's magnetic field, to develop what they call "battle-field MRI" (bMRI). To detect the much weaker signals, their machine uses a superconducting quantum interference device (SQUID), which acts as an extremely sensitive magnetometer. TECHNICAL ARTICLE

Tags: Imaging technology, Military technology

INFORMATION TECHNOLOGY

Tackling the fastest and most powerful computing systems on the planet

PhysOrg.com, 29APR2015

ParaPhrase is an EU sponsored project to improve the programmability and performance of modern parallel computing technologies. The ParaPhrase researchers have developed an approach that allows large parallel programs to be constructed out of standard building blocks called patterns. A refactoring tool allows these patterns to be reassembled in optimal ways without changing the functionality of the overall program.

Tags: Information Technology, S&T EU

MATERIALS SCIENCE

Engineering a better solar cell: UW research pinpoints defects in popular perovskites

Bright Surf, 01MAY2015

Using confocal optical microscopy, an international team of researchers (USA, UK) found "dark" or poorly performing regions of the perovskite material at intersections of the crystals which limit the movement of charges and, therefore, limit the efficiency of the devices. The study provides a clear target for future researchers seeking to improve and grow the material. TECHNICAL ARTICLE

Tags: Materials science

MICROELECTRONICS

Chemists cook up three atom-thick electronic sheets

Science Daily, 03MAY2015

By tuning the growth conditions of molybdenum disulfide films using metal organic chemical vapor deposition (MOCVD), researchers at Cornell University found that their crystals grew perfectly stitched together, with a little bit of hydrogen and in completely dry conditions. They demonstrated their films' efficacy when stacked layer by layer alternating with silicon dioxide and employing standard photolithography. This effectively proved that these three-atom-thick semiconducting films can be made into multi-level electronic devices of unsurpassed thinness. TECHNICAL ARTICLE

Tags: Microelectronics, Advanced materials, Microelectronics, Semiconductors

NEUROSCIENCE

How the brain tells good from bad

MIT News, 29MAY2015

Researchers at MIT have identified two populations of neurons in the amygdala that process positive and negative emotions. These neurons then relay the information to other brain regions that initiate the appropriate behavioral response. TECHNICAL ARTICLE

Tags: Neuroscience

continued...

QUANTUM SCIENCE

Defects in atomically thin semiconductor emit single photons

Science Daily, 04MAY2015

A team of researchers in the US (University of Rochester, NIST) shows how tungsten diselenide can be fashioned into an atomically thin semiconductor that serves as a platform for solid-state quantum dots. Perhaps most importantly the defects that create the dots do not inhibit the electrical or optical performance of the semiconductor and they can be controlled by applying electric and magnetic fields. TECHNICAL ARTICLE

Tags: Quantum science, Government S&T

Quantum-mechanical monopoles discovered

Nanowerk, 30APR2015

Researchers in Finland have observed a point-like monopole in a quantum field itself for the first time. This discovery connects to important characteristics of the elusive monopole magnet. TECHNICAL ARTICLE

Tags: Quantum science, S&T Sweden

S&T POLICY

USA, Russia and China Submarine Lower Detectability Race

Next Big Future, 01MAY2015

Admiralty Shipyards, a Russian company, held a ceremonial launching the Varshavyanka-class diesel-electric submarines. Dubbed the Krasnodar, the vessel is the fourth of a planned six upgraded Kilo-class subs Russia is constructing under Project 636.3. Russia claims the Varshavyanka-class are the "quietest in the world, and so was dubbed 'black hole' by NATO."

Tags: S&T policy, Military technology

China's scientific progress hinges on access to data

Nature News, 28APR2015

It is hard—and getting harder—for Chinese scientists to access high-quality domestic data. Most of the public data are held by government departments, some of which are strengthening their monopoly and making it harder for researchers to access the information.

Tags: S&T policy, S&T China

SENSORS

Combining computer vision, brain computer interface for faster mine detection

Science Daily, 04MAY2015

Researchers at UC San Diego have combined sophisticated computer vision algorithms and a brain-computer interface to find mines in sonar images of the ocean floor. The study shows that the new method speeds up detection considerably, when compared to existing methods—mainly visual inspection by a mine detection expert. TECHNICAL ARTICLE

Tags: Sensors, Military technology

No Hogwarts invitation required: Invisibility cloaks move into the real-life classroom

Science Daily, 30APR2015

Researchers in Germany constructed their cloak from a light-scattering material. By scattering light, the material slows down the effective propagation speed of the light waves through the medium. Then the light can be sped up again to make up for the longer path length around the hidden object.

Tags: Sensors, Imaging Technology, S&T Germany ■

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