Volume 2, Issue 40 ■ 05OCT2012

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

Quantum causal relations: A causes B causes A

University of Vienna, 02OCT2012

Physicists from the University of Vienna have shown that in quantum mechanics it is possible to conceive situations in which a single event can be both, a cause and an effect of another one. Although it is still not known if such situations can be actually found in nature, the sheer possibility that they could exist may have far-reaching implications for the foundations of quantum mechanics, quantum gravity and quantum computing. TECHNICAL ARTICLE

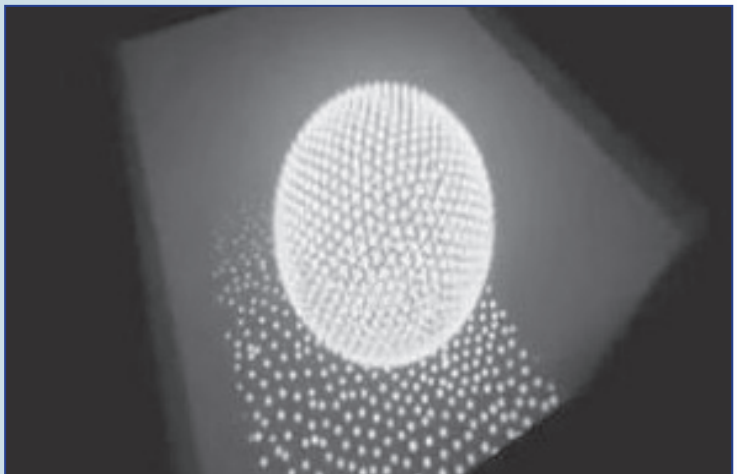
Tags: Quantum science, Featured Article

Watching crystals 'heal' themselves: Novel way to remove defects in materials

Science Daily, 02OCT2012

Physicists at the University of Chicago have succeeded in creating a defect in the structure of a single-layer crystal by simply inserting an extra particle, and then watching as the crystal "heals" itself. The trick to this self-healing property is that the crystal must be curved. This effect carries important implications for improving the conductivity of electronics and other realms of materials science. TECHNICAL ARTICLE

Tags: Materials science, Featured Article



Colloidal beads (bright dots) have assembled themselves on a liquid droplet to form a three-dimensional curved crystalline structure. The positive electric charges cause the beads to repel each other, leading them to arrange themselves naturally in a honeycomb pattern with each particle equally distant from six others. (Credit: Image courtesy of University of Chicago)

First images of Landau levels revealed

Science Daily, 01OCT2012

Using scanning tunnelling spectroscopy, an international team of scientists has revealed the internal ring-like structure of Landau Levels at the surface of a semiconductor. Landau Levels were theoretically conceived of by Nobel prize winner Lev Landau in 1930. In recent years the effect has been used to define the standard for what we mean by electrical resistance and could soon be employed to define the kilogram as well. TECHNICAL ARTICLE

Tags: Breakthrough technology, Quantum science, Featured Article

S&T News Articles

ADVANCED MATERIALS

One glue, two functions: Spider webs stick to the ground and elevated surfaces differently

Science Daily, 02OCT2012

University of Akron scientists show that cobweb spiders use adhesive discs to anchor webs to ceilings, walls and various other surfaces. While they use the same glue on all surfaces, they create it using two different designs to give it a strong or weak grip, depending on whether its prey is flying or crawling on the ground. TECHNICAL ARTICLE

Tags: Advanced materials, Biomimetics

'Passive radar' could render stealth planes obsolete

Wired UK, 01OCT2012

European Aeronautic Defence and Space Company (EADS), has developed a kind of "passive radar" which it claims" can detect stealth aircraft. They have integrated the latest capabilities of digital receiver and signal processing

continued...

BACK TO TOP

technology to significantly enhance range and detection accuracy by monitoring various emitters at the same time.

Tags: Advanced materials, Military technology

All-carbon solar cells

Nanowerk Spotlight, 29SEP2012

New work has now shown that thin film solar cells made entirely out of carbon nanomaterials can achieve an efficiency similar to that of polymer solar cells but with much improved photostability. As a result, the use of carbon materials holds great promise towards the realization of photostable thin film solar cells. TECHNICAL ARTICLE

Tags: Advanced materials, Solar energy

Researchers devise new 'subtractive' type of nanoscale printing

PhysOrg.com, 21SEP2012

A pattern was made in a piece of polydimethylsiloxane using an electron beam to create the stamp. They then covered a base of alkanethiols with gold, which served as the material to be printed on. Then to print the desired pattern, the stamp was applied to the base material, then removed, pulling with it not only the gold top layer, but the alkanethiols beneath, resulting in a pattern being left behind which could serve as either the end product itself or a receptacle for filling by another substance, such as protein molecules.

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

'Green Brain' project to create an autonomous flying robot with a honey bee brain

Science Daily, 01OCT2012

Scientists in the UK will build models of the systems in the brain that govern a honey bee's vision and sense of smell. Using this information, the researchers aim to create the first flying robot able to sense and act as autonomously as a bee, rather than just carry out a pre-programmed set of instructions. If successful, this project will meet one of the major challenges of modern science: building a robot brain that can perform complex tasks as well as the brain of an animal.

Tags: Autonomous systems & robotics, Neuroscience

Snakes on a plane!

KurzweilAI, 01OCT2012

Engineers at firms like Rolls-Royce and GE are developing "snake robots" with intelligent algorithms to find and repair problems in plane engines. The slithering simulants would be about 12.5 millimeters (1/2 inch) in diameter, controlled by a technician as they are guided through the engine's insides, beaming back images.

Tags: Autonomous systems & robotics

Video Friday: Quadrotor Ball Toss, Toyota's Partner Robot, and How to Engineer a Dog

IEEE Spectrum, 28SEP2012

One of the highlights this week comes from ETH Zurich, courtesy RoboHub. This video shows a trio of quadrotors throwing and catching a ball with a net, which is a pretty neat trick.

Tags: Autonomous systems & robotics

BIOTECHNOLOGY

All systems go at the biofactory

e! Science News, 28SEP2012

The finely honed tip of the atomic force microscope (AFM) allows one to pick up single biomolecules and deposit them elsewhere with nanometer accuracy. The technique, referred to as Single-Molecule Cut & Paste (SMC&P), was developed by a research group in Germany. The technique can be used to develop artificial multimolecular assemblies modeled on natural "cellulosomes," which could be used to convert plant biomass into biofuels.

Tags: Biotechnology

Bioengineers Introduce 'Bi-Fi'— The Biological 'Internet'

Science Daily, 27SEP2012

Using the virus M13, researchers at Stanford University have created a biological mechanism to send genetic messages from cell to cell. The system greatly increases the complexity and amount of data that can be communicated between cells. Down the road, the biological Internet could lead to biosynthetic factories in which huge masses of microbes collaborate to make more complicated fuels, pharmaceuticals and other useful chemicals. TECHNICAL ARTICLE

Tags: Biotechnology, Biology

BREAKTHROUGH TECHNOLOGY

Graphene may replace silicon (w/video)

Nanowerk, 30SEP2012

Norwegian researchers are the world's first to develop a method for producing semiconductors from graphene. The method involves growing semiconductor-nanowires on graphene. To achieve this, researchers "bomb" the graphene surface with gallium atoms and arsenic molecules, thereby creating a network of minute nanowires. VIDEO

Tags: Breakthrough technology

Motion Sensor Accurate to the Diameter of a Single Nucleus

IEEE Spectrum, 30SEP2012

Researchers at NIST have built a microelectromechanical system that pushes the lower limits of distance and force measurement down to within a short hail of the theoretical limits—to 2.3 times the standard quantum limit. The

continued...

"Research is the process of going up alleys to see if they are blind."

MARSTON BATES

device is a silicon-on-oxide chip fabricated via electron-beam lithography and reactive ion etching to leave a 15-micrometer-diameter silicon disk, a waveguide and actuators standing in relief from the chip surface.

Tags: Breakthrough technology, Sensors

Electrons confined inside nano-pyramids

Science Daily, 29SEP2012

Given their special properties, researchers see huge potential for quantum dots in technological applications. Before this can happen, however, we need a better understanding of how the electrons "trapped" inside them behave. Dresden physicists have recently observed how electrons in individual quantum dots absorb energy and emit it again as light. TECHNICAL ARTICLE

Tags: Breakthrough technology, Quantum science, S&T Germany

COMMUNICATIONS TECHNOLOGY

Longest Fiber-optic Sensor Network Developed

Science Newsline, 02OCT2012

Researchers in Spain have managed to develop the largest network so far in existence—measuring 250 km. It is equipped with a multiplexing capability, which enables two or more information channels to be combined within a single transmission medium.

Tags: Communications Technology

On-board mobile phone to power low-cost satellite

PhysOrg.com, 01OCT2012

A University of Queensland staff member is sending a satellite into space which measures 10cm x 10cm and is controlled by an on-board Android mobile phone five times more powerful than its larger space-faring cousin. It also has a camera four times more powerful.

Tags: Communications Technology, Space technology

CYBER SECURITY

Sandia builds self-contained, Android-based network to study cyber disruptions and help secure hand-held devices

Sandia Laboratory News, 02OCT2012

Researchers linked together 300,000 virtual hand-held computing devices running the Android operating system so they can study large networks of smartphones and find ways to make them more reliable and secure. The work is expected to result in a software tool that will allow others in the cyber research community to model similar environments and study the behaviors of smartphone networks.

Tags: Cyber security, Government S&T

ENERGY

Doctoral student developing next generation of lithium-ion batteries for longer lasting mobile devices, electric cars

Science Daily, 30SEP2012

Researchers at Kansas State University are developing and testing a high-performance nanostructure of silicon coated onto carbon nanofibers to use as an electrode in lithium-ion batteries. The electrodes, which look like a dense brush, give the battery greater charge capabilities and storage capacity. This is anticipated to replace current commercial electrodes that are made from simple carbon-based materials.

Tags: Energy, Battery

New efficiency record for photovoltaic cells, thanks to heterojunction

Science Daily, 30SEP2012

Scientists in France have developed photovoltaic cells with an energy conversion efficiency of 21.4 percent. They apply an infinitesimal layer—one hundredth of a micron—of amorphous silicon on both sides of a crystalline silicon wafer. This "sandwich" conception contributes to increase the sensors' effectiveness.

Tags: Energy, S&T France, Solar energy

GOVERNMENT S&T

Energy Research Network Reaches 100 Gbps

IEEE Spectrum, 30SEP2012

When the DOE's new 100-gigabit-per-second Energy Sciences Network (ESnet) goes live next month, it will be the world's fastest continent-spanning science network. On top of the dark fiber, ESnet and Internet2 built a layer of optical technology, installing the equipment that receives, transmits, amplifies, regenerates, and combines 100-Gb/s signals. The last layer of technology ESnet engineers built was the routing layer—the links, hubs, and switches that ensure data packets get where they need to go.

Tags: Government S&T, Information technology

Life at DARPA Innovation House Begins

DARPA News, 28SEP2012

"We are examining how collaboration among different disciplines can yield game-changing technologies. For instance, our participants include computer engineers, data architects and imagery analysts. We have thrown them in with a robotics expert from NASA, visual artists and neuroscientists. If this model proves to be successful, it represents a new means of tackling some of the hard problems in government-sponsored research."

Tags: Government S&T

continued...

MATERIALS SCIENCE

New cloak promises to be invisible to electrons

Physics World, 02OCT2012

Physicists in the US have proposed a way to make an "electron cloak". Inspired by cloaks that hide objects from light or sound waves, the electron cloak would be made of a tiny structure that is about the same size as the wavelength of electrons it is hiding from. Although the design has not yet been tested in the lab, it could be used to make novel electronic devices and perhaps even help develop better thermoelectric materials for improved energy harvesting and conversion. TECHNICAL ARTICLE

Tags: Materials science

Invisible barrier wards off metal corrosion

R&D Magazine, 01OCT2012

A coating so thin it's invisible to the human eye has been shown to make copper nearly 100 times more resistant to corrosion, creating tremendous potential for metal protection even in harsh environments. Researchers from Monash University and Rice University say these findings could mean paradigm changes in the development of anticorrosion coatings using extremely thin graphene films.

Tags: Materials science

Solar cell consisting of a single molecule

Nanowerk, 30SEP2012

Researchers in Germany have developed a method to measure photocurrents of a single functionalized photosynthetic protein system. The scientists could demonstrate that such a system can be integrated and selectively addressed in artificial photovoltaic device architectures while retaining their biomolecular functional properties. TECHNICAL ARTICLE

Tags: Materials science, Energy, S&T Germany, Solar energy

Featured Resource

Materials Project

By providing materials researchers with the information they need to design better, the Materials Project aims to accelerate innovation in materials research. Researchers will be able to data-mine scientific trends in materials properties. There are 18,000 chemical compounds and growing.

Tiny resorbable semiconductors: Smooth as silk 'transient electronics' dissolve in body or environment

Science Daily, 29SEP2012

Dubbed "transient electronics," the new class of silk-silicon devices promises a generation of medical implants that never need surgical removal, as well as environmental monitors and consumer electronics that can become compost rather than trash. The futuristic devices incorporate silicon and magnesium but in an ultrathin form that is then encapsulated in silk protein. VIDEO, TECHNICAL ARTICLE

Tags: Materials science, Semiconductors

Nickelblock: An element's love-hate relationship with battery electrodes

EurekAlert, 28SEP2012

Battery materials on the nano-scale reveal how nickel forms a physical barrier that impedes the shuttling of lithium ions in the electrode, reducing how fast the materials charge and discharge. Researchers at PNNL found that the longer the nanoparticles stayed at high temperature during fabrication, the more nickel segregated and the poorer the particles performed in charging and discharging tests. TECHNICAL ARTICLE

Tags: Materials science, Battery

New simulation method produces realistic fluid movements

EurekAlert, 26SEP2012

The method distinguishes itself significantly from known simulation methods which use mesh structures where the vertices are locked in a fixed position. In the new method, the mesh structure is replaced by a dynamic structure where the vertices move one at a time. This makes it possible to take account of the fluid's physical properties more precisely and to see how different types of fluids interact with one another. TECHNICAL ARTICLE, VIDEOS

Tags: Materials science

MEDICAL SCIENCES

Overcoming the limitations of antibodies

Asia Research News, 28SEP2012

The most crucial factor in identifying anthrax is to identify the diseases' protein which is currently done using antibodies. However, the production of antibodies is costly and the process is complicated and it is easily affected by environmental factors. Researchers in Korea have found an innovative solution called 'Polyvalent Directed Peptide Polymer (PDPP)' which overcomes the limitations of antibodies.

Tags: Medical Sciences, Biotechnology, Materials science

MICROELECTRONICS

New method monitors semiconductor etching as it happens -- with light

Science Daily, 30SEP2012

Researchers have a new low-cost method to carve delicate features onto semiconductor wafers using light. The technique can monitor a semiconductor's surface as it is etched, in real time, with nanometer resolution. This allows

continued...

the researchers to create complex patterns quickly and easily, and adjust them as needed. The new method allows researchers to monitor the whole wafer at once instead of point-by-point. TECHNICAL ARTICLE

Tags: Microelectronics

NEUROSCIENCE

How memory load leaves us 'blind' to new visual information

Science Daily, 01OCT2012

The new results reveal that our visual field does not need to be cluttered with other objects to cause this 'blindness' and that focusing on remembering something we have just seen is enough to make us unaware of things that happen around us. The research reveals a pathway of competition in the brain between new visual information and our short-term visual memory that was not appreciated before. TECHNICAL ARTICLE

Tags: Neuroscience

Researchers identify brain region that generates optimism bias

Wired UK, 30SEP2012

Researchers from the University College of London (UCL) have discovered that not only does the brain produce an optimism bias for good news, but that such a bias could actually be harmful for our decision-making capabilities. TECHNICAL ARTICLE

Tags: Neuroscience

When Your Eyes Tell Your Hands What to Think

Northwestern University, 28SEP2012

When you pick up a mug by the handle with your right hand, you need to add a clockwise twist to your grip to compensate for the extra weight that you see on the left side of the mug. A new Northwestern University study shows that, not only does your brain handle such complex decisions for you, it also hides information from you about how those decisions are made. TECHNICAL ARTICLE

Tags: Neuroscience

QUANTUM SCIENCE

Unforgeable quantum credit cards in sight

Nanowerk, 02OCT2012

A team of physicists at Max-Planck-Institute of Quantum Optics, Harvard University, and California Institute of Technology develops a scheme for noise tolerant and yet safely encrypted quantum tokens. TECHNICAL ARTICLE

Tags: Quantum science, Cyber Security, S&T Germany

Quantum Dots Tuned for Entanglement - Viewpoint

American Physical Society Spotlight, 01OCT2012

Researchers have applied a combination of an electric field and mechanical strain to a system of quantum dots in order to correct for asymmetries that usually prevent these semiconductor nanostructures from emitting entangled photons. TECHNICAL ARTICLE

Tags: Quantum science

S&T POLICY

New incubator facility for breakthrough research in engineering of complex molecular systems

Nanowerk, 01OCT2012

ICMS (Institute for Complex Molecular Systems), founded in 2008 by TU/e (Netherlands), aims to gain a deeper understanding of complex molecular self-assembly processes. This will enable the development of completely new materials and functional molecular systems such as cultured kidney tissue and molecular 'motors'. To do this the institute brings together knowledge of chemistry, mathematics, physics, biology and engineering. ICMS

Tags: S&T policy

EU grant to investigate nano-electro-mechanical relay-based computing

Nanowerk, 30SEP2012

A collaborative consortium hopes to build the world's first fully functioning nano-electro-mechanical (NEM) relay-based processor targeting an energy efficiency that cannot be matched by transistor implementations thanks to a 2.44 million euro grant by the European Commission. The NEMIAC project (Nano-Electro-Mechanical Integration and Computation) will investigate this new technology to build digital integrated circuits for ultra-low power computing applications.

Tags: S&T policy, Information technology, Microelectronics, S&T EU

Canadian science and technology is healthy and growing, says expert panel

EurekAlert, 27SEP2012

A newly released report by the Council of Canadian Academies entitled, The State of Science and Technology in Canada, 2012 provides a thorough analysis of the scientific disciplines and technological applications where Canada excels in a global context. REPORT

Tags: S&T policy, S&T Canada

SCIENCE WITHOUT BORDERS

Design to 'harpoon satellites'

BBC News, 02OCT2012

The harpoon would be fired at the hapless satellite from close range. A propulsion pack tethered to the projectile would then pull the junk downwards, to burn up in the atmosphere.

Tags: Science without borders, S&T UK, Space technology

continued...

Black Holes Weigh the Possibility of a Massive Photon

American Physical Society Spotlight, 30SEP2012

A massive photon is not theoretically ruled out, but it would have implications for the dispersion of light and the existence of magnetic monopoles. However, the mere existence of spinning (unbombed) black holes constrains this possibility. VIDEO

Tags: Science without borders

STEM

In novel move, NYC campus gets US patent officer

R&D Magazine, 02OCT2012

According to the U.S. Commerce Department and Cornell University a patent worker will be assigned to the new CornellNYC Tech applied sciences school. Officials say the initiative will help students, researchers and businesses get patent protection for promising ideas with less red tape.

Tags: STEM ■

About This Publication

To subscribe (or unsubscribe), visit https://tin-ly.sainc.com/ASDRE. To provide feedback or ask questions, contact us at asdre-st-bulletin-reply@sainc.com.

This publication is authored and distributed by:

Dr. Melissa Flagg
Director, Office of Technical Intelligence (OTI)

Ms. Hema Viswanath
OTI Corporate Librarian