Volume 3, Issue 47 ■ 22NOV2013

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

World's Smallest FM Radio Transmitter

Science Daily, 18NOV2013

Researchers at Columbia University have taken advantage of graphene's special properties and created a nano-mechanical system that can create FM signals, in effect the world's smallest FM radio transmitter. The device is much smaller than any other sources of radio signals, and can be put on the same chip that is used for data processing. TECHNICAL ARTICLE

Tags: Communications Technology, Advanced materials, Featured Article

Quantum World Record Smashed: Quantum State Survives at Room Temperature for 39 Minutes

A normally fragile quantum state has been shown to survive at room temperature for a world record 39 minutes by Oxford University researchers. An artistic rendition of a 'bound exciton' quantum state used to prepare and read out information stored in the form of quantum bits. (Credit: © 2013 Stef Simmons with CC BY)

Science Daily, 14NOV2013

An international team of researchers (Canada, UK, Germany) have shown that quantum state can survive at room temperature for a world record 39 minutes, overcoming a key barrier towards building ultrafast quantum computers. TECHNICAL ARTICLE

Tags: Quantum science, S&T Canada, S&T Germany, S&T UK, Featured Article

Fantastic Phonons: Blocking Sound, Channeling Heat With 'Unprecedented Precision'

Science Daily, 13NOV2013

According to researchers at the Georgia Institute of Technology, the new area of phononics research seeks to control sound waves by designing and fabricating cloaking shells to guide acoustic waves around a certain object—an entire building, perhaps—so that whatever is inside the shell is invisible to the sound waves. The phononics approach to cloaking is based on electromagnetic cloaking materials that are already in use for light. TECHNICAL ARTICLE

Tags: Imaging technology, Featured Article

S&T News Articles

ADVANCED MATERIALS

Graphene: Minor Rotation of 'Chicken Wire' Has Major Consequences

Science Daily, 18NOV2013

Researchers in the Netherlands have developed an understanding of the interaction between different two-dimensional materials and with metals by inserting a boron nitride layer between a layer of copper and a layer of graphene. The findings are important for designing electronic components based on graphene and other 2D materials.

Tags: Advanced materials, Microelectronics

Researchers grow graphene on silver

Nanowerk, 18NOV2013

The method used by researchers from Northwestern University and Argonne National Laboratory could advance graphene-based optical devices and enable the interfacing of graphene with other two-dimensional materials. TECHNICAL ARTICLE

Tags: Advanced materials

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Overcoming Brittleness: New Insights Into Bulk Metallic Glass

Science Daily, 15NOV2013

Berkeley Lab and Caltech researchers are studying a way to improve the fatigue resistance of monolithic bulk glasses which are major components of bulk metallic composites. Bulk metallic glasses are poised to be mainstay materials for the 21st Century. TECHNICAL ARTICLE

Tags: Advanced materials

Large Graphene Crystals With Exceptional Electrical Properties Created

Science Daily, 14NOV2013

Researchers at the University of Texas, Austin, used surface oxygen to grow centimeter-size single graphene crystals on copper. The crystals were about 10,000 times as large as the largest crystals from only four years ago. Very large single crystals have exceptional electrical properties. TECHNICAL ARTICLE

Tags: Advanced materials

Organizing Programmed Nanoparticles Into Highly Complex Nanostructures

Science Daily, 07NOV2013

Researchers in Germany have discovered a new principle for the self-assembly of patterned nanoparticles. The research findings represent a breakthrough in the field of hierarchical structuring and nano-engineering as it allows creating new materials by self-assembling preprogrammed particles. TECHNICAL ARTICLE

Tags: Advanced materials, S&T Germany

Perfect Faults: A Self-Correcting Crystal May Unleash the Next Generation of Advanced Communications

Science Daily, 06NOV2013

Based on NIST's measurements, the new materials—a family of multilayered crystalline sandwiches—might enable a whole new class of compact, high-performance, high-efficiency components for devices such as cellular phones. TECHNICAL ARTICLE

Tags: Advanced materials, Communications Technology

BIG DATA

New 5-D Method to Understand Big Data

Science Daily, 18NOV2013

Neuroscientists at Florida Atlantic University designed a method, called a five dimensional (5D) colorimetric technique, to interpret enormous amounts of data derived from their research on the human brain. It is able to graph spatiotemporal data which has not previously been achieved.

Tags: Big data

COMMUNICATIONS TECHNOLOGY

Pioneering advanced fibre technologies for next-generation internet

PhysOrg.com, 18NOV2013

Researchers at EU project MODE-GAP ('Multi-mode capacity enhancement with PBG fibre') are working to boost the Internet's capacity by developing and testing advanced fibre technologies. These pathways or 'modes' are essentially independent, so different information can be transmitted along each mode. The fibres use a form of 'spatial-division multiplexing', utilising the spatial dimension to increase transmission capacity. MODE Gap

Tags: Communications Technology, S&T EU

Study Reveals Potential Breakthrough in Hearing Technology

Science Daily, 18NOV2013

Researchers at Ohio State University have developed a computer algorithm which quickly analyzes speech and removes most of the background noise. They hope their technology will pave the way for next-generation digital hearing aids. Such hearing aids could even reside inside smartphones; the phones would do the computer processing, and broadcast the enhanced signal to ultra-small earpieces wirelessly. TECHNICAL ARTICLE

Tags: Communications Technology

Toward New Quantum Possibilities: Seeing a Photon Without Absorbing It

Science Daily, 14NOV2013

All current methods of detecting light share a common property: absorption and thus destruction of a photon. Scientists in Germany have now, for the first time, realized a device which leaves the photon untouched upon detection. This provides new possibilities for using single photons in quantum communication and quantum information processing. TECHNICAL ARTICLE

Tags: Communications Technology, Quantum science, S&T Germany

CYBER SECURITY

Locking Down the Cloud

Science Daily, 06NOV2013

Researchers in Germany have developed what they call "a privacy-friendly architecture" for future cloud computing systems where software licensing and software payment is required. The same approach would also allow the software providers to lock out malicious users. TECHNICAL ARTICLE

Tags: Cyber security, S&T Germany

continued...

"The whole of science is nothing more than a refinement of everyday thinking."

ALBERT EINSTEIN

ENERGY

Optimizing Electronic Correlations for Superconductivity

Science Daily, 18NOV2013

Researchers from the US and China have discovered that two distinctly different iron-based compounds share common mechanisms for moving electrons, thus moving closer to creating practical superconductors. TECHNICAL ARTICLE

Tags: Energy, Materials science

ENVIRONMENTAL SCIENCE

Research Program to Tackle Asteroid, Space Debris Manipulation

Science Daily, 18NOV2013

Led by the UK, world-leading scientists will push the boundaries of studies on how to deflect asteroids and manipulate space debris under the Stardust program.

Tags: Environmental science, Space technology

FORECASTING

Near-Future Heat and Precipitation Extremes Predicted

Science Daily, 17NOV2013

Unlike long-term climate predictions, forecasts about the next twenty to fifty years are fraught with major uncertainties. In spite of this, researchers in Switzerland have now managed to make projections about the future distribution of heat and precipitation extremes. TECHNICAL ARTICLE

Tags: Forecasting, Climatology, S&T Switzerland

IMAGING TECHNOLOGY

Using Airport Screening Technology to Visualize Waves in Fusion Plasma

Science Daily, 13NOV2013

Researchers at UC Davis and DOE Energy Laboratory at Princeton University have shown that a quasi-optical radar technique images millimeter-wave radiation reflected from fusion plasmas in 2D, time-resolved images. This novel application lets researchers image waves in fusion plasmas in startling detail, and provides vital information to devise strategies to avoid instabilities which can reduce fusion power output.

Tags: Imaging technology, Energy, Government S&T, Materials science

Thin, Active Invisibility Cloak Demonstrated for First Time

Science Daily, 12NOV2013

Researchers in Canada have demonstrated an effective invisibility cloak that is thin, scalable and adaptive to different types and sizes of objects. Beyond obvious applications, such as hiding military vehicles or conducting surveillance operations, this cloaking technology could eliminate obstacles—for example, structures interrupting signals from cellular base stations could be cloaked to allow signals to pass by freely. TECHNICAL ARTICLE

Tags: Imaging technology, S&T Canada

MATERIALS SCIENCE

A Fresh Step Towards Quantum Computing

Science Daily, 19NOV2013

Researchers in Germany have developed a method to manipulate magnetism in atoms. This research makes it possible to drive forward the exploration of new methods of information storage and computation on an atomic scale. TECHNICAL ARTICLE

Tags: Materials science, Quantum science, S&T Germany

A Gooey Cure for Crack-Prone High-Capacity Batteries

MIT Technology Review, 17NOV2013

Researchers at Stanford University have shown that mixing one such promising battery material, silicon microparticles, with self-healing polymers helps prevent a longer-lasting battery from failing. They say the self-healing polymers could stabilize other promising but damage-prone battery materials. TECHNICAL ARTICLE

Tags: Materials science, Battery

Two for One in Solar Power: New Process Could Revolutionize Solar Energy Harvesting

Science Daily, 17NOV2013

Researchers in the UK and Belgium have investigated the process in which the initial electronic excitation can split into a pair of half-energy excitations. This can happen in certain organic molecules when the quantum mechanical effect of electron spin sets the initial spin 'singlet' state to be double the energy of the alternative spin 'triplet' arrangement. TECHNICAL ARTICLE

Tags: Materials science, Energy

continued...

Hydrogen Fuel from Sunlight? Low-Cost, Long-Lasting Water Splitter Made of Silicon and Nickel

Science Daily, 14NOV2013

Stanford University scientists have created a silicon-based water splitter that is both low-cost and corrosion-free. The novel device—a silicon semiconductor coated in an ultrathin layer of nickel—could help pave the way for large-scale production of clean hydrogen fuel from sunlight. TECHNICAL ARTICLE

Tags: Materials science, Energy

Nanomagnets arise at 2-D boundaries

Nanowerk, 14NOV2013

According to a new theory by Rice University scientists, imperfections in certain two-dimensional materials create the conditions by which nanoscale magnetic fields arise. This may lead to new strategies for the growing field of spintronics, which takes advantage of the intrinsic spin of electrons and their associated magnetic fields for electronic and computing devices. TECHNICAL ARTICLE

Tags: Materials science, Microelectronics

A Nano-Sized Sponge Made of Electrons

Science Daily, 12NOV2013

An international team of researchers (France, Spain) showed that the electrons absorbed and released by cerium dioxide nanoparticles during chemical reactions are not bound to individual atoms but, like a cloud, distribute themselves over the whole nanoparticle. Cerium dioxide nanoparticles are widely used in industrial processes and also in consumer products. The research helps optimise their current and future use, and address the limits of their safe use. TECHNICAL ARTICLE

Tags: Materials science, Advanced materials, S&T France

Structure of Bacterial Nanowire Protein Hints at Secrets of Conduction

Science Daily, 12NOV2013

Researchers at DOE's PNNL studying the protein that makes up a tiny electrical wire that protrudes from some bacteria, have determined the protein's structure. The finding is important to such diverse fields as producing energy, recycling Earth's carbon and miniaturizing computers. TECHNICAL ARTICLE

Tags: Materials science, Biotechnology, Materials science

Novel LEDs Pave the Way to Cheaper Displays

Science Daily, 08NOV2013

Researchers in Switzerland have developed a novel type of OLED. These lights are suitable for the design of particularly energy-efficient cheap displays, which find applications in smart phones, tablet PCs or TVs. TECHNICAL ARTICLE

Tags: Materials science

MICROELECTRONICS

Organic semiconductor transistor made of a single nanoparticle achieves highest mobility yet

PhysOrg.com, 15NOV2013

Scientists from Taiwan have designed and built an organic semiconductor transistor with a mobility that is 2-3 orders of magnitude higher than that of conventional organic semiconductor transistors. The benefits of high mobility could extend to a wide range of applications, such as organic LED displays, organic solar cells, and organic field-effect transistors. TECHNICAL ARTICLE

Tags: Microelectronics, Materials science

Accidental Discovery Dramatically Improves Electrical Conductivity

Science Daily, 14NOV2013

Washington State University researchers have achieved a 400-fold increase in the electrical conductivity of a crystal simply by exposing it to light. The effect, which lasted for days after the light was turned off, could dramatically improve the performance of devices like computer chips. TECHNICAL ARTICLE

Tags: Microelectronics, Materials science

Single-atom bit forms smallest memory in the world

Nanowerk, 14NOV2013

Researchers in Japan and Germany have taken a big step towards a single-atom bit: They fixed a single atom on a surface such that the magnetic spin remained stable for ten minutes. TECHNICAL ARTICLE

Tags: Microelectronics, S&T Germany, S&T Japan

NEUROSCIENCE

Multitasking Neurons Filter and Decide: How Neural Circuits Identify Information Needed for Decisions

Science Daily, 06NOV2013

Based on the biological data of combining brain recordings from trained monkeys and a sophisticated computer model, researchers at Stanford University found that the entire decision-making process may occur in a localized region of the prefrontal cortex. TECHNICAL ARTICLE

Tags: Neuroscience

continued...

QUANTUM SCIENCE

Largest quantum cluster created

Australian National University, 19NOV2013

An international team of researchers (Japan, Australia) created the largest cluster of quantum systems ever—a milestone on the way to super-powerful, super-fast quantum computers. Previously the world record was 14, but their experiment went to more than 10,000 systems. TECHNICAL ARTICLE

Tags: Quantum science, S&T Australia, S&T Japan

Physicists reveal a quantum Cheshire cat

Physics World, 18NOV2013

Properties of objects can exist independently of the objects themselves. That is the conclusion of a group of physicists from Israel and the UK, which has shown how the strange laws of quantum mechanics permit a photon to be in one place and its circular polarization in another.

Tags: Quantum science, S&T UK

Revisiting Quantum Effects in Micro And Nano-Electromechanical Devices

Science Daily, 15NOV2013

New calculations by Mexican researchers show that the influence of quantum effects on the operating conditions of nanodevices has, until now, been overestimated. They also demonstrate that the stability of these devices under the Casimir force changes depending on the nature and thickness of the metal coatings used, and on the variation of concentration of the free charges in the silicon used, which changes with doping levels. TECHNICAL ARTICLE

Tags: Quantum science

SCIENCE WITHOUT BORDERS

After 84 Years, Von Neumann-Day Math Problem Finally Solved

Science Daily, 18NOV2013

Researchers at Cornell University describe a geometric solution for the von Neumann-Day problem, first described by mathematician John von Neumann in 1929.

Tags: Science without borders, Mathematics

SENSORS

New Hologram Technology Created With Tiny Nanoantennas

Science Daily, 15NOV2013

Researchers at Purdue University have created tiny holograms using a "metasurface" capable of the ultra-efficient control of light, representing a potential new technology for advanced sensors, high-resolution displays and information processing. Metasurfaces could make it possible to use single photons for switching and routing in future computers. TECHNICAL ARTICLE

Tags: Sensors ■

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