Volume 4, Issue 36 ■ 05SEP2014

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

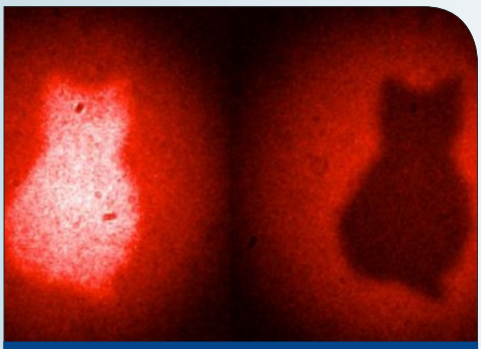
Breakthrough in light sources for new quantum technology

Science Daily, 29AUG2014

Researchers in Denmark have developed an extremely small photonic crystal designed so that all of the photons are sent through only one channel. They can control the photons and send them in the direction they want with a 98.4 percent success rate. This is ultimate control over the interaction between matter and light and has amazing potential. It opens up fascinating new opportunities for fundamental experiments and new technologies. TECHNICAL ARTICLE

Tags: Quantum science, Featured Article

Quantum physics enables revolutionary imaging method



A new quantum imaging technique generates images with photons that have never touched to object -- in this case a sketch of a cat. Credit Copyright: Patricia Enigl, IQOQI

Science Daily, 28AUG2014

Using "entangled" pairs of photons, researchers in Austria have obtained an image without ever detecting the light that was used to illuminate the imaged object, while the light revealing the image never touches the imaged object. TECHNICAL ARTICLE

Tags: Quantum science, Imaging Technology, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

Pioneer strategy for creating new materials

Science Daily, 29AUG2014

Researchers at DOE's Argonne National Laboratory used X-ray scattering during MBE to observe the behavior of atoms as layered oxides were being formed. These observations were then used as data for computational predictions of new materials. This new strategy gives faster feedback on what growth strategies are best, thus shortening the timeframe to actual manufacture of a new, stable material. TECHNICAL ARTICLE

Tags: Advanced manufacturing, Government S&T

ADVANCED MATERIALS

Controlled Crystals Make a New Solar Material Practical

MIT Technology Review, 31AUG2014

Certain perovskites can harvest energy from sunlight very efficiently because they strongly absorb both visible and infrared light. However, it has proven difficult to make high quality perovskite solar cells consistently. Now an international team of researchers (South Korea, Switzerland, Germany) found that by carefully controlling the concentrations of the starting solutions, and other processing conditions, they could consistently make perovskite films with the larger crystals needed for an efficient solar cell. TECHNICAL ARTICLE

Tags: Advanced materials

Growing nanotubes in a targeted way

Nanowerk, 29AUG2014

An international team of researchers have succeeded in creating single-walled and largely defect-free carbon nanotubes with a defined chirality from molecular precursors in a controlled way. These precursor molecules form a kind of seed on a platinum surface which helps a flat sheet of carbon atoms to form a tube.

Tags: Advanced materials, CNT

continued...

BACK TO TOP

Shedding more light on CNT photocurrent

Nanotechweb, 27AUG2014

Researchers in Germany have succeeded in measuring photocurrent from solution-processed SWCNTs for the first time—a feat that will help in the development of optoelectronics applications made from these nanostructures in the future. TECHNICAL ARTICLE

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

Atomically seamless, thinnest-possible semiconductor junctions crafted by scientists

Science Daily, 26AUG2014

According to researchers at the University of Washington two single-layer semiconductor materials can be connected in an atomically seamless fashion. This result could be the basis for next-generation flexible and transparent computing, better light-emitting diodes, or LEDs, and solar technologies. TECHNICAL ARTICLE

Tags: Advanced materials

Inkjet-printed superparamagnetic polymer composite hemispheres

Nanowerk, 26AUG2014

Researchers in Switzerland present the fabrication and characterization of large arrays of inkjet-printed superparamagnetic polymer composite (SPMPC) hemispherical microstructures. SPMPC-based microarchitectures can be used to perform different functions wirelessly in various media (e.g. water, solvents) using external magnetic fields: handling and assembling small objects, delivering drugs or biomass, or sensing specific physical or chemical changes. TECHNICAL ARTICLE

Tags: Advanced materials, S&T Switzerland

Graphene drum could form future quantum memory (w/video)

Nanowerk, 25AUG2014

Researchers in the Netherlands have demonstrated that they can detect extremely small changes in position and forces on very small drums of graphene. Graphene drums have great potential to be used as sensors in devices such as mobile phones. Using their unique mechanical properties, these drums could also act as memory chips in a quantum computer. TECHNICAL ARTICLE

Tags: Advanced materials, Quantum science

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Google Delivery Drones, Strange Robot Game, and Humanoid Does Ice Bucket Challenge

IEEE Spectrum, 29AUG2014

Unlike Amazon, which is apparently using conventional rotor-based vehicles (a questionable choice for a delivery UAV), Google chose instead a winged design that flies like a plane but takes off vertically, an approach with potential benefits like faster speeds and extended range.

Tags: Autonomous systems & robotics

Five Myths and Facts About Robotics Technology Today

IEEE Spectrum, 26AUG2014

Ever faster processors, cheaper sensors, abundant open-source code, ubiquitous connectivity, and the advent of 3D printing are some of the forces behind the recent proliferation of robots. We'll inevitably face challenges involving our adoption and use of robots. The author presents a list of what he considers are five pressing issues concerning robotics and identifies each as a myth or a fact.

Tags: Autonomous systems & robotics

ELECTRONIC WARFARE

Electromagnetic Warfare Is Here

IEEE Spectrum, 25AUG2014

A briefcase-size radio weapon could wreak havoc in our networked world. EM attacks are not only possible—they are happening. Governments and professional organizations have been aware of the problem called intentional electromagnetic interference (IEMI) at least since the 1990s; in the wake of attacks like the one in South Korea, they began to take it seriously.

Tags: Electronic Warfare

ENERGY

Scientists create renewable fossil fuel alternative using bacteria

Science Daily, 02SEP2014

Researchers in the UK have engineered the harmless gut bacteria E.coli to generate renewable propane. The development is a step towards commercial production of a source of fuel that could one day provide an alternative to fossil fuels. TECHNICAL ARTICLE

Tags: Energy, Biotechnology, S&T UK

Australian scientists are a step closer to converting sunlight and water into fuel

Science Alert (Australia), 27AUG2014

Researchers in Australia have managed to modify a naturally occurring protein, and use it to capture energy from sunlight, a key step in photosynthesis. Now they need to work on using this protein to create biological, water-splitting systems. TECHNICAL ARTICLE

Tags: Energy, S&T Australia

Germany and Canada Are Building Water Splitters to Store Energy

MIT Technology Review, 27AUG2014

The electrolyzer projects under construction in Germany typically consist of a few buildings, each the size of a

continued...

"If you thought that science was certain — well, that is just an error on your part."

RICHARD FEYNMAN

shipping container, that consume excess renewable energy on sunny and windy days by turning it into an electric current that powers the water-splitting reaction. The resulting hydrogen can then be pumped into the storage and distribution infrastructure.

Tags: Energy, S&T Germany

IMAGING TECHNOLOGY

Non-invasive single-shot imaging through scattering layers and around corners via speckle correlations

Nature Photonics, 31AUG2014

Researchers in France have experimentally demonstrated single-shot imaging through scattering media and around corners using spatially incoherent light and various samples, from white paint to dynamic biological samples. Their technique is simple, does not require wavefront-shaping nor time-gated or interferometric detection, and is realized in the experiment using a camera-phone. It has the potential to enable imaging in currently inaccessible scenarios.

Tags: Imaging technology, S&T France

INFORMATION TECHNOLOGY

Inter-dependent networks stress test

PhysOrg.com, 28AUG2014

Researchers in the UK found that the severity of cascading failure increases significantly when inter-network connections are one-directional. They also found that the degree of redundancy—which is linked to the number of connections—in inter-network connections can have a significant effect on the robustness of systems, depending on the direction of inter-network connections. TECHNICAL ARTICLE

Tags: Information Technology, S&T UK

MATERIALS SCIENCE

Simpler process to grow germanium nanowires could improve lithium-ion batteries

Science Daily, 29AUG2014

Researchers at Missouri University have developed a simple, less expensive, one-step method to grow nanowires of germanium from an aqueous solution. Their process could make it more feasible to use germanium in lithium-ion batteries. TECHNICAL ARTICLE

Tags: Materials science, Battery

New analytical technology reveals 'nanomechanical' surface traits

Science Daily, 28AUG2014

Researchers at Purdue University use a new technique called nanomechanical Raman spectroscopy to measure the 'nanomechanical' properties of tiny structures undergoing stress and heating. Data is likely to yield insights to improve designs for microelectronics and batteries. TECHNICAL ARTICLE

Tags: Materials science

Laser pulse turns glass into a metal: New effect could be used for ultra-fast logical switches

Science Daily, 26AUG2014

Researchers in Austria have shown that with ultra-short laser pulses the electronic properties of glass can be fundamentally changed within femtoseconds. If the laser pulse is strong enough, the electrons in the material can move freely. For a brief moment, the quartz glass behaves like metal, becomes opaque and conducts electricity. This change of material properties happens so quickly that it can be used for ultra-fast light based electronics. TECHNICAL ARTICLE

Tags: Materials science, Advanced materials

MICROELECTRONICS

A Chip for Longer-Lasting Wearable Computers

MIT Technology Review, 28AUG2014

The new chip, made by a startup company, is intended to work alongside the main processor inside a device, performing functions such as listening for voice commands and running simple apps. That saves energy by allowing the main processor to spend more time powered down.

Tags: Microelectronics

Symphony of nanoplasmonic and optical resonators produces laser-like light emission

Science Daily, 26AUG2014

Researchers at the University of Illinois at Urbana-Champaign have made optical systems at the microscopic scale that amplify light and produce ultra-narrowband spectral output. These new optical amplifiers are well-suited for routing optical power on a chip containing both electronic and optical components. TECHNICAL ARTICLE

Tags: Microelectronics, Optical communication

continued...

NEUROSCIENCE

Neurons in human skin perform advanced calculations

Alphagalileo, 01SEP2014

A fundamental characteristic of neurons that extend into the skin and record touch is that they branch in the skin so that each neuron reports touch from many highly-sensitive zones on the skin. According to researchers in Sweden, this branching allows first-order tactile neurons not only to send signals to the brain that something has touched the skin, but also process geometric data about the object touching the skin. TECHNICAL ARTICLE

Tags: Neuroscience, S&T Sweden

Neuroscientists reverse memories' emotional associations: Brain circuit that links feelings to memories manipulated

Science Daily, 27AUG2014

Researchers at MIT reveal the brain circuit that controls how memories become linked with positive or negative emotions. They found that they could reverse the emotional association of specific memories by manipulating brain cells with optogenetics. TECHNICAL ARTICLE

Tags: Neuroscience

Featured Resource

MIT World

Which ideas and innovations can change the world? MIT World™ answers that question by publishing key presentations by the MIT faculty and guest speakers who are shaping the future. These free on-demand videos are available 24/7 to viewers worldwide.

QUANTUM SCIENCE

Quantum control of molecules for ultra-fast computers: Single laser stops molecular tumbling motion instantly

Science Daily, 02SEP2014

Researchers at Northwestern University have figured out an elegant way to stop a molecule from tumbling so that its potential for new applications, such as quantum computing, can be harnessed: shine a single laser on a trapped molecule and it instantly cools to the temperature of outer space, stopping the rotation of the molecule. TECHNICAL ARTICLE

Tags: Quantum science

You can now learn everything you've wanted to know about quantum phenomena free online

Science Alert (Australia), 02SEP2014

The University of New South Wales in Sydney, Australia has just kicked off a YouTube series on quantum phenomena, The Quantum Around You, led by one of our favourite lecturers Andrea Morello. There'll be a new lecture/episode each Tuesday over at "UNSW's eLearning channel."

Tags: Quantum science, S&T Australia

Back to the future for quantum computers

Nanowerk, 29AUG2014

An international team of researchers (Japan, USA) integrated a PPLO circuit into the measurement scheme for a superconducting qubit using a superconducting waveguide and a SQUID termination. Using their PPLO circuit, the researchers were able to accurately measure the state of a qubit without destroying it. The information readout could then persist in the PPLO even if the qubit underwent a transition to a different state. TECHNICAL ARTICLE

Tags: Quantum science

Step lightly: All-optical transistor triggered by single photon promises advances in quantum applications

PhysOrg.com, 29AUG2014

Researchers in Germany demonstrated a free-space single-photon transistor based on two-color Rydberg interaction, which they say could achieve high optical gain and high efficiency. Moreover, the researchers state that the finding may lead to advances in quantum information processing, condensed matter physics, single step multi-photon entanglement, and other important areas. TECHNICAL ARTICLE

Tags: Quantum science, S&T Germany

A new, tunable device for spintronics

Science Daily, 28AUG2014

An international team of researchers (UK, Japan, Cyprus, Germany, Czech Republic) has developed a tunable spin-charge converter made of GaAs. They demonstrated that the creation or detection efficiency of spin currents is electrically tunable in a certain regime. The underlying mechanism, revealed by theoretical work, opens up a new approach in searching and engineering spintronic materials. TECHNICAL ARTICLE

Tags: Quantum science

continued...

S&T POLICY

80 percent of organizations are turning to citizen developers to drive innovation

PhysOrg.com, 26SEP2014

IBM today announced the results of a global study that revealed 80 percent of leading enterprises are forming new partnerships with "citizen developers," industry professionals operating outside the scope of enterprise IT. These citizen developers help to close the skills gap for application development to drive greater collaboration and innovation across cloud, analytics, mobile and social technologies. REPORT

Tags: S&T policy

China's Reform of R&D Budget Management Doesn't Go Far Enough

Science Newsline, 29AUG2014

In almost 20 years, China's R&D expenditure as a percentage of its gross domestic product has more than tripled. This figure surpasses the 28 member states of the EU, which collectively managed 1.96 per cent. However, despite this, China saw a sharp decline in money spent on scientific research, in particular, applied research. Basic research funding plummeted from 5.2 per cent in 1995 to 4.7 per cent in 2011, and applied research funding fell from 26.4 per cent to 11.8 per cent in the same years.

Tags: S&T policy, S&T China

China team takes on tech challenge of supercavitation

PhysOrg.com, 27AUG2014

China has moved a step closer to creating a supersonic submarine that could make the trip from Shanghai to San Francisco in less than two hours. Scientists in China are exploring how supercavitation could get people where they want to go. During the cold war the Soviet military developed supercavitation technology, which involves enveloping a submerged vessel inside an air bubble to avoid problems caused by water drag. Article on Superactivation.

Tags: S&T policy, S&T China

SCIENCE WITHOUT BORDERS

Mysteries of space dust revealed

PhysOrg.com, 29AUG2014

The first analysis of space dust collected by a special collector onboard NASA's Stardust mission and sent back to Earth for study in 2006 suggests the tiny specks open a door to studying the origins of the solar system and possibly the origin of life itself.

Tags: Science without borders

Limits on Fundamental Limits to Computation

arXiv, 17AUG2014

To outline what is achievable in principle and in practice, authors recall how some limits were circumvented and compare loose and tight limits. They also point out that engineering difficulties encountered by emerging technologies may indicate yet-unknown limits. TECHNICAL ARTICLE

Tags: Science without borders, Mathematics ■

About This Publication

The appearance of external hyperlinks in this publication does not constitute endorsement by the United States Department of Defense (DoD) of the linked web sites, nor the information, products or services contained therein. In addition, the content featured does not necessarily reflect DoD's views or priorities.

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:

Office of Technical Intelligence (OTI)
Ms. Hema Viswanath, OTI Corporate Librarian