Volume 4, Issue 27 ■ 04JUL2014

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

The Space-Based Quantum Cryptography Race

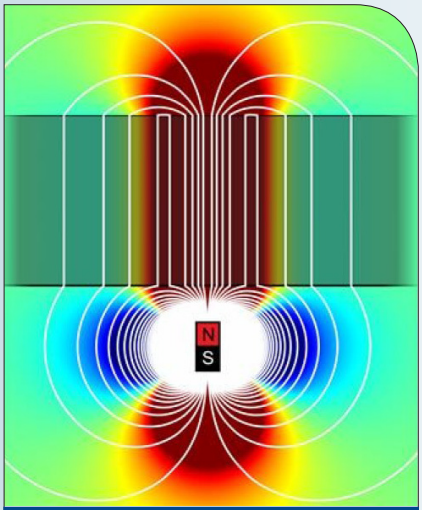
MIT Technology Review, 27JUN2014

Researchers in Italy have bounced polarized photons off a number of different satellites and measured the error rate in the photons that return to Earth. They clearly show that the error rate can be made smaller than the critical threshold of less than 11 percent. That's a useful step forward in the race to provide perfectly secure communication channels between different parts of the planet. TECHNICAL ARTICLE

Tags: Quantum science, Communications Technology, Featured Article

Innovation: Magnetic field conductors

Science Daily, 25JUN2014



A new technology transfers magnetic fields to arbitrary long distances, which is comparable to transmitting and routing light in optical fibers.
Credit: Illustration by Universitat Autònoma de Barcelona

An international team of researchers (Germany, Austria) proposed a scheme, and experimentally demonstrated a device to transfer magnetic fields to arbitrary long distances which is comparable to transmitting and routing light in optical fibers. The field of possible applications is broad and includes spintronic and quantum computers among others.

Tags: Communications Technology, Breakthrough technology, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

Tiny beating hearts grown in the lab (w/video)

Science Alert (Australia), 26JUN2014

To help find a cure for hypertrophy, a lethal form of heart disease, researchers in the UK developed tiny beating hearts and used chemicals to make them mimic the symptoms of being hypertrophic. The tiny hearts have been constructed from stem cells and are just 1 mm in diameter. They contract unaided at around 30 beats per minute. Although human hearts have been grown in labs before, this is the first time it has ever been possible to induce disease in them.

Tags: Advanced manufacturing, Biotechnology, Medical technology, S&T UK

ADVANCED MATERIALS

Energy storage technology: More pores for more power

Science Daily, 30JUN2014

Researchers in Germany have succeeded in producing a novel type of nanofiber, whose highly ordered and porous structure gives it an extraordinarily high surface-to-volume ratio and high pore volume. It allows sulfur to bind to the electrode in a finely divided manner. This enhances the efficiency of the electrochemical processes that occur in the course of charge-discharge cycles. TECHNICAL ARTICLE

Tags: Advanced materials, Battery, Energy, S&T Germany

Nanocircuits exhibit a counterintuitive phenomenon: the coexistence of superconductivity with dissipation

Nanowerk, 30JUN2014

Researchers at the University of Minnesota made nanowires smaller and cooler than anyone had done previously allowing the quasiparticles to travel through the wire faster and avoid relaxation. This leads to a peculiar nonthermal state, which combines properties

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of a superconductor and a normal metal at the same time. TECHNICAL ARTICLE

Tags: Advanced materials

2D molybdenum disulfide could be a promising new transistor material

Nanowerk, 27JUN2014

Besides both intrinsic charge and spin, molybdenum disulfide has an extra degree of freedom called a valley, which can produce a perpendicular, chargeless current that does not dissipate any energy as it flows. Researchers at Cornell University showed the presence of this valley current in a molybdenum disulfide transistor they designed. The valley degree of freedom can be used as an information carrier for next-generation electronics or optoelectronics. TECHNICAL ARTICLE

Tags: Advanced materials, Materials science

Let there be light: Chemists develop magnetically responsive liquid crystals for writing tablets, billboards and more

Science Daily, 16JUN2014

The liquid crystals, developed by researchers at UC Riverside, are essentially magnetic nanorods. Optically these magnetic rods work in a similar way to commercial rod-like molecules, with the added advantage of being able to respond rapidly to external magnetic fields. Requiring no electrodes, the liquid crystals have applications in anti-counterfeit technology and optical communication devices for controlling the amplitude, phase, polarization, and propagation direction of light. TECHNICAL ARTICLE

Tags: Advanced materials, Materials science

AUTONOMOUS SYSTEMS & ROBOTICS

Video Monday: Curiosity's First Martian Year, Android Newscasters, and Baxter Gets a Promotion

IEEE Spectrum, 30JUN2014

Rather than try and develop some kind of submarine for exploring ice-covered oceans, NASA instead went with an axle-type rover. The rover is waterproof and has enough positive buoyancy that it "sticks" to the underside of the ice.

Tags: Autonomous systems & robotics

BIG DATA

Getting computers to analyse opinions in blogs

Alphagalileo, 01JUL2014

Researchers in Norway collected 3,000 blogs with 1.4 million blog posts about climate change published from 2005 onwards. Instead of searching for individual key words, the researchers are developing a program which will be able to relate key concepts so that it is possible to find the opinion in what is being said. The technology should work regardless of language or topic.

Tags: Big data

A simple solution for big data: New algorithm simplifies the categorization of data

Science Daily, 26JUN2014

Researchers in Italy used a new way of identifying the centre of the cluster in cluster analysis which proved to be very efficient. They tested their mathematical model on an archive of facial photographs, obtaining highly satisfactory results. The system recognised most individuals correctly, and never produced 'false positive' results. TECHNICAL ARTICLE

Tags: Big data, S&T Italy

ENERGY

Pop-up solar station can take electricity, water and shelter anywhere

Science Alert (Australia), 27JUN2014

A company in the US has developed 'the PowerCube,' a new 'pop-up' solar station that can be transported via shipping container and installed anywhere with the push of a button. The PowerCube is completely self-contained, remotely monitored and controlled, and can be manufactured in three different sizes to match standard shipping container varieties. The first model will be released this month.

Tags: Energy, Solar energy

Supercapacitors and Li-ion batteries in one neat device

Nanotechweb, 26JUN2014

An international team of researchers (USA, China, Saudi Arabia) has fabricated 3D nanostructured thin-film electrodes using tantalum oxide nanotubes and "carbon-onion"-coated iron oxide nanoparticles. The thin films appear to be excellent lithium-ion batteries while being good supercapacitors too. The devices might be ideal for next-generation hybrid energy-storage applications, including wearable "smart textiles." TECHNICAL ARTICLE

Tags: Energy, Battery

IMAGING TECHNOLOGY

Single-pixel 'multiplex' captures elusive terahertz images

EurekAlert, 29JUN2014

Researchers at Boston College developed a "multiplex" tunable spatial light modulator that uses a series of filter-like "masks" to retrieve multiple samples of a terahertz scene, which are reassembled by a single-pixel detector. TECHNICAL ARTICLE

Tags: Imaging technology, Terahertz technology

continued...

"Facts are the air of scientists. Without them you can never fly."

LINUS PAULING

Carbon fiber clouds hiding naval destroyers from anti-ship missiles

Defense Update, 28JUN2014

The US Navy has recently tested a new anti-ship missile countermeasure system using an obscurant generator prototype. The systems and tactics were tested under a variety of at-sea conditions using assets from the U.S. Army, Navy, and Air Force to evaluate how radar-absorbing, carbon-fiber clouds can prevent a missile from detecting and striking its target as part of a layered defense.

Tags: Imaging technology, Government S&T, Military technology

MATERIALS SCIENCE

Chemist builds device to measure chemical warfare agent effects on surfaces

PhysOrg.com, 30JUN2014

Researchers from a US Army laboratory and Virginia Tech are studying the decomposition of chemical warfare agents on surfaces. They are interested in the reaction mechanisms: What happens to molecules when they come to rest on surfaces? How do they move as they transform from reactants into products? TECHNICAL ARTICLE

Tags: Materials science, Counter WMD, Government S&T

New superconductor world record set

Science Daily, 26JUN2014

Researchers in the UK managed to 'trap' a magnetic field with a strength of 17.6 Tesla in a high temperature gadolinium barium copper oxide (GdBaCuO) superconductor, beating the previous record by 0.4 Tesla. The new record could herald the arrival of materials in a broad range of fields. TECHNICAL ARTICLE

Tags: Materials science, S&T UK

MICROELECTRONICS

IBM: Commercial Nanotube Transistors Are Coming Soon

MIT Technology Review, 01JUL2014

Chips made with nanotube transistors, which could be five times faster, should be ready around 2020, says IBM. Its chosen design uses six nanotubes lined up in parallel to make a single transistor. Each nanotube is 1.4 nanometers wide, about 30 nanometers long, and spaced roughly eight nanometers apart from its neighbors. Both ends of the six tubes are embedded into electrodes that supply current, leaving around 10 nanometers of their lengths exposed in the middle.

Tags: Microelectronics

Stanford engineers envision an electronic switch just 3 atoms thick

EurekAlert, 01JUL2014

Researchers at Stanford University have discovered a flexible, switchable material which is a crystal that can form a paper-like sheet just three atoms thick. Computer simulations show that this crystalline lattice has the remarkable ability to behave like a switch: it can be mechanically pulled and pushed, back and forth, between two different atomic structures—one that conducts electricity well, the other that does not. This could lead to flexible electronic materials and enable a cell phone to be woven into a shirt. TECHNICAL ARTICLE

Tags: Microelectronics

Memcapacitors could make our computers faster

Nanotechweb, 27JUN2014

Using the standard configuration of a Dynamic Random Access Memory, where the capacitors have been substituted with solid-state based memcapacitive systems, an international team of researchers (Spain, USA, Italy) shows the possibility of performing WRITE, READ and polymorphic logic operations by only applying modulated voltage pulses to the memory cells. TECHNICAL ARTICLE

Tags: Microelectronics

NEUROSCIENCE

Brain fills gaps to produce a likely picture

Science Daily, 27JUN2014

Researchers in the Netherlands use visual illusions to demonstrate to what extent the brain interprets visual signals. They were surprised to discover that active interpretation occurs early on in signal processing. The primary visual brain cortex is normally regarded as the area where eye signals are merely processed, but that has now been refuted by the new results. TECHNICAL ARTICLE

Tags: Neuroscience

Controlling body movement with light: Neuroscientists inhibit muscle contractions by shining light on spinal cord neurons

Science Daily, 26JUN2014

Researchers at MIT used optogenetics to explore the function of inhibitory interneurons, which form circuits with many other neurons in the spinal cord. These circuits execute commands from the brain, with additional input from sensory information from the limbs. The research raises questions such as whether this mechanism behaves

continued...

as a global "kill switch," or if the inhibitory neurons form modules that allow for more selective suppression of movement patterns. TECHNICAL ARTICLE

Tags: Neuroscience

Learning by repetition impairs recall of details, study shows

Science Daily, 23JUN2014

According to researchers at UC Irvine while repetition enhances the factual content of memories, it can reduce the amount of detail stored with those memories. This means that with repeated recall, nuanced aspects may fade away. TECHNICAL ARTICLE

Tags: Neuroscience

Featured Resource

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Current events and breaking news on physical, biological, environmental, space and computer sciences. RSS

QUANTUM SCIENCE

Researchers Create Quantum Dots with Single-Atom Precision

Naval Research Laboratory, 29JUN2014

An international team of researchers (USA, Germany, Japan) has used a scanning tunneling microscope to create quantum dots with identical, deterministic sizes. The perfect reproducibility of these dots opens the door to quantum dot architectures completely free of uncontrolled variations, an important goal for technologies from nanophotonics to quantum information processing as well as for fundamental studies.

Tags: Quantum science

'Compressive sensing' provides new approach to measuring a quantum system

Science Daily, 27JUN2014

Researchers at the University of Rochester have shown that a technique called compressive sensing offers a way to measure both momentum and position at the same time, without violating the Uncertainty Principle. Compressive sensing uses the possibility of compressing the signal to be able to recover more information from relatively few measurements, and therefore obtain an understanding of the system. TECHNICAL ARTICLE

Tags: Quantum science

Spintronic technologies: Advanced light source provides new look at skyrmions

Science Daily, 25JUN2014

An international team of researchers (USA, Japan) has studied and observed skyrmions in copper selenite, an insulator with multiferroic properties. The results not only hold promise for ultracompact data storage and processing, but may also open up entire new areas of study in the emerging field of quantum topology. TECHNICAL ARTICLE

Tags: Quantum science

SCIENCE WITHOUT BORDERS

Not much force: Researchers detect smallest force ever measured

Science Daily, 26JUN2014

Using a combination of lasers and a unique optical trapping system that provides a cloud of ultracold atoms, researchers at DOE's Lawrence Berkeley National Laboratory measured a force of approximately 42 yoctonewtons. The research points the way to confirm the existence of gravitational waves, and improved atomic force microscopy. TECHNICAL ARTICLE

Tags: Science without borders, Government S&T

Physicist suggests speed of light might be slower than thought

PhysOrg.com, 26JUN2014

Based on observations made of the supernova SN 1987A, researchers at the University of Maryland suggest that a photon splits into a positron and an electron, for a very short time before recombining back into a photon. That should create a gravitational differential between the pair of particles which would have a tiny energy impact when they recombine—enough to cause a slight bit of a slowdown during travel. TECHNICAL ARTICLE

Tags: Science without borders

Toward quantum technologies

PhysOrg.com, 26JUN2014

Director of the EU project Q-ESSENCE talks about the challenges and applications of quantum mechanics-based communication technologies and what happened since the completion of the project.

Tags: Science without borders, S&T EU

A farewell to arms? Scientists developing a novel technique that could facilitate nuclear disarmament

Science Daily, 25JUN2014

Researchers at Princeton University and DOE are developing a novel approach, called "zero-knowledge protocol," which would verify the presence of warheads without collecting any classified information. TECHNICAL ARTICLE

Tags: Science without borders

continued...

The breakthrough of hypervelocity launch performed on 3-stage light gas gun in CAEP

Bright Surf, 25JUN2014

Researchers in China have made significant progress in optimizing launcher configuration, physical design of the flier plate, material processing and experimental measurement technology. Experimental data of equation of state for the material under ultra-high pressure was also obtained.

Tags: Science without borders, Military technology, S&T China

SENSORS

Bee-inspired landing system will sting aircraft hackers

PhysOrg.com, 30JUN2014

Bees use optic flow for their descent—using the rate of motion beneath them to guide their landing and they may also use stereo vision for their touchdown to judge distance. Researchers in Canada have incorporated both of these techniques in the landing system. The system is independent of laser-range sensors, radio beacons or GPS signals. TECHNICAL ARTICLE

Tags: Sensors, Biomimetics, S&T Canada

Scientists develop force sensor from carbon nanotubes

Nanowerk, 30JUN2014

An international team of researchers (Russia, Belarus, Spain) used the relationship between the tunneling current and the distance between the ends of the nanotubes to determine the relative position of the carbon nanotubes and thus to find the magnitude of the external force exerted on them. Future applications include converting the force sensor into a magnetic field sensor. TECHNICAL ARTICLE

Tags: Sensors

World-first miniaturized fiber-optical monitoring system embedded in composite material

Nanowerk, 30JUN2014

Under the EU project SMARTFIBER, researchers have demonstrated the world's first miniaturized fiber-optical sensor system that can be fully embedded in a composite material. This achievement paves the way toward smart composites that enable continued and automatic monitoring of the structural health of the composite material.

Tags: Sensors, Materials science, S&T EU

Packing hundreds of sensors into a single optical fiber for use in harsh environments

Science Daily, 26JUN2014

Researchers at the University of Pittsburgh have created an all-optical high-temperature sensor for gas flow measurements that operates at record-setting temperatures above 800 degrees celsius. It is expected to find industrial sensing applications in harsh environments, such as deep geothermal drill cores or space missions. TECHNICAL ARTICLE

Tags: Sensors ■

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