



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[New insights into the remote control of quantum systems](#)

[Science Daily, 07AUG2012](#)

An international team of researchers have shown that under certain circumstances, non-entangled states can outperform their entangled counterparts for quantum communication, quantum cryptography, and quantum computation—as long as they have a significant amount of so-called “quantum discord.”

This novel and not yet fully understood measure of quantum correlations quantifies the disturbance of correlated particles when being measured.

[TECHNICAL ARTICLE](#)

Tags: Quantum science, S&T Australia, Featured Article

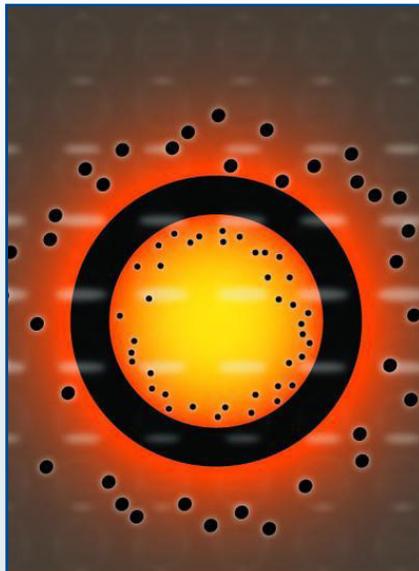
[Measuring the Shape of a Photon](#)

[American Physical Society Spotlight, 03AUG2012](#)

Researchers in Italy demonstrate a way to fine-tune the measurement of a series of individual photons that are in an identical but arbitrary state. The scheme also expands the possibilities for using complex internal states of light to transmit data.

[TECHNICAL ARTICLE](#)

Tags: Communications Technology, S&T Italy, Featured Article



This is a graphic representation of remotely prepared quantum states. In their experiment, the researchers demonstrated that it is possible to prepare quantum states remotely by means of quantum discord (outside the circle) which might not always be possible to achieve by means of entanglement (inside the circle). (Credit: Copyright: University of Vienna)

ADVANCED MATERIALS

[New phenomenon in nanodisk magnetic vortices](#)

[Nanowerk, 08AUG2012](#)

In an experiment made possible by the unique X-ray beams at Berkeley Lab's Advanced Light Source (ALS), a team of US researchers in collaboration with scientists in Japan discovered that contrary to what was previously believed, the formation of magnetic vortices in ferromagnetic nanodisks is an asymmetric phenomenon. It is possible that this breaking of symmetry would lead to failure in a data storage device during its initialization process.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials, Information technology

[New Metamaterials Device Focuses Sound Waves Like a Camera Lens](#)

[Newswise, 07AUG2012](#)

For the first time, a team of Penn State researchers has designed and computationally tested a type of man-made metamaterial capable of manipulating a variety of acoustic waves with one simple device. This invention will benefit almost all current sonic and ultrasonic applications, such as ultrasonic nondestructive evaluations and ultrasonic imaging.

Tags: Advanced materials, Metamaterials

[Artificial evolution of enzymes to make novel semiconductors](#)

[Foresight Institute, 04AUG2012](#)

Scientists at the University of California, Santa Barbara have developed synthetic cells that can be used to evolve enzymes that make novel structures of silicon dioxide and titanium dioxide not seen in nature. The next challenge is to learn how to change the selection processes to evolve a specific property, such as semiconductor performance.

Tags: Advanced materials, Semiconductors

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Riding herd on photons**Nanowerk, 04AUG2012**

Researchers at MIT, Zhejiang University in China, and the University of Texas at Austin describe a new “metamaterial” that keeps photons moving in only one direction, rechanneling the stragglers rather than simply absorbing them. Although the prototype is large, it doesn’t require the application of a magnetic field, so it could in principle, yield optical components much smaller than today’s isolators. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials***BIG DATA****How to Spot the Next Big Banking Scandal****MIT Technology Review, 08AUG2012**

A company called Digital Reasoning hopes to help banks find this critically important information with machine-learning software that raises red flags found in messy or “unstructured” text data, including e-mails, tweets, and document files. The software uses statistical models to break down sentences and infer their meaning.

*Tags: Big data***How To Find Strategic Advantage From Big Data****Information Week, 07AUG2012**

Few top-level executives understand the changes necessary in data-gathering and decision-making processes well enough to make big-data migrations a real priority. Whether they’re prepared to deal with it or not, even mid-size companies have to face big data, not for the benefits it could offer, but because nearly all corporate data has become “big,” according to reports from Ventana Research, Forrester, and other analysts.

*Tags: Big data***BIOTECHNOLOGY****Researchers build a toolbox for synthetic biology****MIT News, 03AUG2012**

A team of researchers from Boston University, Harvard Medical School and Massachusetts General Hospital have come up with a new method to design transcription factors for nonbacterial cells (in this case, yeast cells). Their initial library of 19 new transcription factors should help overcome the existing bottleneck that has limited synthetic biology applications.

*Tags: Biotechnology, Synthetic biology***BREAKTHROUGH TECHNOLOGY****Nano tool may transform how we define electrical current****EU R&D News, 08AUG2012**

According to researchers in the UK, the novel nanodevice they have developed handles single electrons to stimulate

electrical current. This development could potentially replace today’s ampere, which depends on measurements of mechanical forces on current-carrying wires.

[TECHNICAL ARTICLE](#)*Tags: Breakthrough technology, Advanced materials, Nanotechnology***CYBER SECURITY****A Computer Infection that Can Never Be Cured****MIT Technology Review, 02AUG2012**

At the Black Hat security conference in Las Vegas last week, Jonathan Brossard, a French hacker, demonstrated software that can be hidden deep inside the hardware of a PC creating a back door that would allow secret remote access over the Internet. His secret entrance can’t even be closed by switching a PC’s hard disk or reinstalling its operating system.

*Tags: Cyber security***ENERGY****Chemists Advance Clear Conductive Thin Films****Science Newsline, 07AUG2012**

Researchers from Brown University and ATMI Inc. made conductive ITO films 146 billionths of a meter thick that allowed 93 percent of light to pass through, a transparency comparable to the glass plates they were deposited on. The team also made their films on top of bendable polyimide, showing that it could potentially be useful for making flexible display technologies.

*Tags: Energy, Solar energy***First prototype of a fully functional all-flexible electronic system (w/video)****Nanowerk, 07AUG2012**

In a new study, researchers in Korea have fabricated an all-solid-state bendable lithium-ion battery (LIB) structured with high-density inorganic thin films using a new universal transfer approach, which enables the realization of diverse flexible LIBs regardless of electrode chemistry.

[TECHNICAL ARTICLE](#), [VIDEO](#)**ENVIRONMENTAL SCIENCE****Dust from Asia pollutes US, Canada air: study****PhysOrg.com, 02AUG2012**

Dust and aerosol pollution from Asia travels across the ocean and sullies the air in the United States and Canada, possibly worsening the effects of climate change, a study showed. The team included experts at the University of Maryland, NASA Goddard Space Flight Center and Universities Space Research Association in Maryland.

[TECHNICAL ARTICLE](#)*Tags: Environmental science, Climatology*

“Science is the highest personification of the nation because that nation will remain the first which carries the furthest the works of thought and intelligence.” LOUIS PASTEUR

IMAGING TECHNOLOGY

[Seeing through walls: Laser system reconstructs objects hidden from sight](#)

[Science Daily](#), 07AUG2012

Using advanced optics in the form of an ultrafast laser and a 2-D streak camera, both of which operate on the order of trillions of cycles per second, a team of researchers from MIT, Harvard, the University of Wisconsin, and Rice University exploited being able to capture billions of images per second to demonstrate the technology's ability to “see” objects by analyzing the light moving around a corner or through water bottle.

[TECHNICAL ARTICLE](#)

Tags: Imaging technology

[Disney researchers add sense of touch to augmented reality applications](#)

[EurekaAlert](#), 06AUG2012

Technology developed by Disney Research, Pittsburgh, makes it possible to change the feel of real-world surfaces and objects, including touch-screens, walls, furniture, wooden or plastic objects, without requiring users to wear special gloves or use force-feedback devices.

[TECHNICAL ARTICLE](#), [VIDEO](#)

Tags: Imaging technology

[An Augmented Reality Welding Helmet](#)

[MIT Technology Review](#), 03AUG2012

University of Toronto researchers have developed a state-of-the-art digital camera that is able to properly adjust itself to capture an image with brights that are far too bright, and darks that are far too dark. [VIDEO](#)

Tags: Imaging technology, Military technology

INFORMATION TECHNOLOGY

[Touch your philodendron and control your computer](#)

[EurekaAlert](#), 03AUG2012

Any houseplant—real or artificial—could control a computer or any digital device with this technology called Botanicus Interactus. Once a single wire is placed anywhere in the plant's soil, the technology can detect if and where a plant is touched, or even if someone gets near the plant. [TECHNICAL ARTICLE](#), [VIDEO](#)

Tags: Information Technology

MATERIALS SCIENCE

[Higgs transition of north and south poles of electrons in a magnet](#)

[e! Science News](#), 07AUG2012

Minimal evidence of a Higgs transition^{✖1} of north and

south poles of electron spins was observed in a magnet Yb₂Ti₂O₇ at the absolute temperature^{✖2} 0.21 K. A fractionalization of these monopoles from electron spins was observed on cooling to 0.3 K. On further cooling below 0.21 K, the material showed the ferromagnetism to be understood as a superconductivity of monopoles.

[TECHNICAL ARTICLE](#)

Tags: Materials science

[A new way of assembling particles into complex structures \(w/video\)](#)

[Nanowerk](#), 03AUG2012

Researchers at the University of Pennsylvania have identified a simple new method to direct particle assembly based only on surface tension and particle shape. Self-assembling spherical particles have been used to make new materials with unique optical and mechanical properties, but non-spherical, or anisotropic, particles may hold even greater promise. By having a definable directionality, the properties of the materials the particles make up can be altered based on their orientations. [VIDEO](#)

Tags: Materials science, Advanced materials

[CERN teams post Higgs Boson papers - one ups its sigma level of certainty](#)

[PhysOrg.com](#), 03AUG2012

The two teams working at the CERN Large Hadron Collider CMS and ATLAS, have both uploaded papers describing their work in searching for evidence of the particle that is believed to explain why matter sticks together, the elusive Higgs Boson, to the preprint server arXiv. In their paper, [ATLAS](#) has bumped up its sigma level of certainty from 5.0 to 5.9 while [CMS](#) has kept its level at the 4.9 to 5 range.

Tags: Materials science

[Electromagnetic ‘swamps’ don’t always bog electrons down](#)

[Science Daily](#), 03AUG2012

Duke University physicists were manipulating the environment of tunneling electrons using electrical leads and carbon nanotubes when they unexpectedly discovered they could create a quantum phase transition. The team created an energy-draining environment in the leads and then measured how easily the electrons moved through the resonant level in the nanotube at ultra-low temperature.

[TECHNICAL ARTICLE](#)

Tags: Materials science

[Physicist bends light waves on surfboards](#)

[Science Daily](#), 03AUG2012

A researcher in the UK has recently built what he describes as a ‘surface wave black hole’ using the surfboard foam.

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He has created a circle of material that has a radially graded index (the higher the index, the slower the light travels through the medium), and placed it on the surface of a metamaterial. The radiation propagating across the metamaterial is then refracted, spiraling inwards to an absorbing core.

Tags: Materials science

FEATURED RESOURCE

TechXtra

TechXtra helps you find articles, books, the best websites, the latest industry news, job announcements, technical reports, technical data, full text eprints, the latest research, thesis & dissertations, teaching and learning resources and more, in engineering, mathematics and computing.

MICROELECTRONICS

Could an SRAM Hourglass Save RFID Chips Just in Time?

[IEEE Spectrum](#), 07AUG2012

A new technology developed by researchers at the University of Massachusetts, Amherst, creates a short-duration “clock” on batteryless radio-frequency identification (RFID) chips, rendering their cryptographic systems much less vulnerable to attack. The clock operates over spans of seconds to minutes after an RFID chip is charged up from an RFID reader or other ambient radio-wave energy. As a result, even after the radio signal is removed, the clock endows the RFID chip with the ability to know when its security keys may be in danger.

Tags: Microelectronics, Cyber Security

Nanowires give vertical transistors a boost

[Physics World](#), 02AUG2012

Researchers in Japan have made an important advance in developing a new type of silicon-based transistor by successfully creating vertical transistors from semiconducting nanowires on a silicon substrate. The wires made from InGaAs are surrounded by 3D – rather than planar-shaped – gates, with the finished devices having extremely good electronic properties.

Tags: Microelectronics, Semiconductors

Very Thin Lasers Could Speed Computers

[IEEE Spectrum](#), 02AUG2012

A new type of ultrasmall laser could bring optical communications onto computer chips, breaking a bottleneck that limits computing speed. The device is a vertical-cavity surface-emitting laser (VCSEL), which emits light through its top surface. Chip designers will most likely prefer VCSELs to more traditional, edge-emitting lasers, in which the beam comes out of one end. VCSELs are easier to manufacture, easier to align with elements like optical fibers, and easy to build into arrays of multiple lasers.

Tags: Microelectronics, Information technology

NEUROSCIENCE

How the brain's stem cells find out when to make new neurons

[KurzweilAI](#), 08AUG2012

Apparently, they “listen in” on the chemical communication among nearby neurons to find out what is stressing the system and when they need to act” say Johns Hopkins researchers. The researchers say understanding this process of chemical signaling may shed light on how the brain reacts to its environment.

Tags: Neuroscience, Medical Sciences

Brain imaging can predict how intelligent you are.

[Science Daily](#), 03AUG2012

New research suggests that as much as 10 percent of individual differences in intelligence can be explained by the strength of neural pathways connecting the left lateral prefrontal cortex to the rest of the brain. [TECHNICAL ARTICLE](#)

Tags: Neuroscience

QUANTUM SCIENCE

Caught on camera: quantum mechanics in action

[University of Glasgow](#), 08AUG2012

The team of researchers at the University of Glasgow have taken a step towards the development of quantum computation by measuring strong spatial entanglement of photons using a highly-sensitive camera. Making use of a 201 by 201 pixel array, the camera could observe the full field of the quantum light at the same time, allowing the team to see up to 2,500 different entangled dimensions or states.

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

Chinese team builds first quantum router

[PhysOrg.com](#), 07AUG2012

To build their router the team first generated a photon with superposition (one that has both horizontal and vertical polarization states); they then converted the photon to two entangled photons that also had superposition states. Then they treated one of the entangled pair as the control signal and the other as the data signal. When the control signal is read, and destroyed, the router gains the information it needs to know regarding which of two optical fiber cables to send the data signal, and thus, routes the data signal down the desired path. It does demonstrate that routing quantum data is possible. [TECHNICAL ARTICLE](#)

Tags: Quantum science, S&T China

Can the future affect the past?

[Physics World](#), 04AUG2012

“Backward causality” might exist in nature, according to new thought experiment in quantum physics described by Yakir Aharonov of Tel-Aviv University in Israel and

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colleagues. At the heart of the idea is the quantum phenomenon of “nonlocality”, in which two or more particles exist in interrelated or “entangled” states that remain undetermined until a measurement is made on one of them. Once the measurement takes place, the state of the other particle is instantly fixed too, no matter how far away it is. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[Major step taken towards ‘unbreakable’ message exchange](#)

[Science Daily, 03AUG2012](#)

The techniques currently being used on a commercial scale rely on lasers to create the source of photons; however, researchers in Germany hope to further increase the efficiency of QKD by using two devices made up of different semiconductor materials to produce single photons of different colours. Whereas the emission events in lasers occur completely random in time, an ideal single photon source emits exactly one photon upon a trigger event. [TECHNICAL ARTICLE](#)

Tags: Quantum science, Cryptology, S&T Germany

[Quantum Computers Have a Fit – Synopsis](#)

[American Physical Society, 02AUG2012](#)

Even with the uninteresting bits filtered out, modern large-scale science creates mind-boggling amounts of data, causing standard techniques like curve fitting to run into a brick wall. Quantum computing—harnessing nonlocality and entanglement to make solving really hard problems more efficient—might have the prescription for this headache. Researchers at the University of Waterloo, Canada, propose an algorithm to improve the data analyzer’s best friend, least-squares fitting, on a quantum computer. [TECHNICAL ARTICLE](#)

Tags: Quantum science

S&T POLICY

[The evolution of interdisciplinarity in physics research](#)

[Nature Scientific Reports, 03AUG2012](#)

We observe a clear trend towards increasing interactions between the different sub-fields. The network of sub-fields also exhibits core-periphery organization, the nucleus being dominated by Condensed Matter and General Physics. However, over time Interdisciplinary Physics is steadily increasing its share in the network core, reflecting a shift in the overall trend of Physics research.

Tags: S&T policy, STEM

[Collaboration in Academic R&D: A Decade of Growth in Pass-Through Funding](#)

[NSF News, 02AUG2012](#)

Research collaboration involving multiple institutions is a growing trend, as can be seen by increases in the amount of total expenditures for research and development that universities pass through to others and receive from others (pass-through funds). Funds passed through universities to others grew from \$1.4 billion in FY 2000 to \$3.8 billion in FY 2009, and pass-through funds received by universities from others grew from \$1.8 billion to \$4.1 billion.

[REPORT](#)

Tags: S&T policy, R&D Funding

SENSORS

[Ultra sensitive nanobiosensors for detection of ethanol](#)

[Nanowerk, 04AUG2012](#)

Researchers have developed a glassy carbon electrode modified with a nanocomposite comprised of multi-walled carbon nanotubes which enables detection of low concentration of ethanol in different environments. At low concentrations ethanol appears as an ingredient in the composition of many pharmaceutical drugs and hence its precise measurement can serve as a criterion for quality analysis of these products. [TECHNICAL ARTICLE](#)

Tags: Sensors

[Photonics: Sensing on the way](#)

[Science Daily, 03AUG2012](#)

Researchers at the A*STAR Singapore Institute of Manufacturing Technology have now developed an optical fiber system that is able to deliver light to microfluidic chips with high efficiency. The empty hollow core can be filled with liquids. The liquid is important to promote the transport of light through the core. [TECHNICAL ARTICLE](#)

Tags: Sensors ■

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