



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[Long-range tunneling of quantum particles](#)

[Nanowerk, 12JUN2014](#)

Researchers in Austria have directly observed tunneling dynamics in a much more intriguing system. They see quantum particles transmitting through a whole series of up to five potential barriers under conditions where a single particle could not do the move. Instead the particles need to help each other via their strong mutual interactions and via an effect known as Bose enhancement. [TECHNICAL ARTICLE](#)

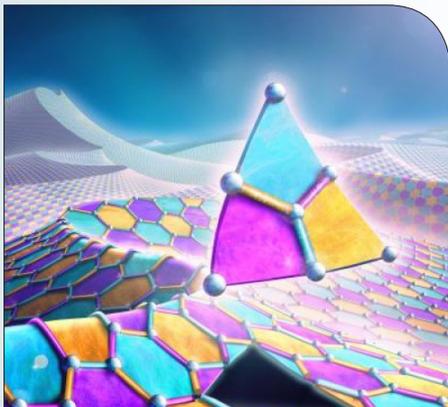
Tags: Quantum science, Featured Article

[Quantum computation: Fragile yet error-free](#)

[Science Daily, 12JUN2014](#)

An international team of researchers (Austria, Spain) has experimentally encoded one qubit in entangled states distributed over several particles and for the first time carried out simple computations on it. The 7-qubit quantum register could be used as the main building block for a quantum computer that corrects any type of error. [TECHNICAL ARTICLE](#)

Tags: Quantum science, Communications Technology, Featured Article



This 7-ion system applied for encoding one logical quantum bit can be used as a building block for much larger quantum systems. The bigger the lattice, the more robust it becomes.

Credit: IQOQI/Harald Ritsch

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[Memory Cells Built on Paper](#)

[IEEE Spectrum, 16JUN2014](#)

Researchers in Taiwan used a combination of inkjet and screen printing to make small resistive RAM memory cells on paper. They created memory cells as small as 50 micrometers. They could potentially be packed together to store about 1000 bits per centimeter which amounts to about 1 MB on a single side of a sheet of standard A4 paper. Better inkjet printers capable of printing submicrometer features could increase the memory capacity to 1 GB.

Tags: Advanced manufacturing

ADVANCED MATERIALS

[Doped defects tune graphene for electronics](#)

[Nanowerk Spotlight, 12JUN2014](#)

Researchers in Brazil have found that the incorporation of nitrogen atoms at the defective region in graphene opens a bandgap suitable for electronic applications. Nitrogen doping not only dictates whether the material is metallic or semiconducting, but even allows the width of the energy gap to be tuned. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

[Insulating or metallic? Bilayer graphene patches can be both](#)

[Nanotechweb, 11JUN2014](#)

An international team of researchers have found that bilayer patches in an otherwise monolayer sheet of epitaxial graphene grown on a silicon carbide substrate can behave as either metals or insulators depending on their electrostatic environment. The finding could help in the development of radiofrequency transistors from graphene for wireless applications. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, S&T Sweden, S&T UK

Steel's inner strength[PhysOrg.com, 10JUN2014](#)

Researchers in the UK have created a very strong alloy called super bainite. With a tensile strength of some 2.5 gigapascals, just one square metre can support a weight equivalent to the weight of 2.5 billion apples. It has a higher density of interfaces than any other type of metal, and is the world's first bulk nanostructured metal. It is now being manufactured in the UK for use as stronger and cheaper armour for front-line military vehicles.

Tags: Advanced materials, S&T UK

AUTONOMOUS SYSTEMS & ROBOTICS**Video Friday: World Cup Exoskeleton, Robot Cockroaches, and Chocolate Drone**[IEEE Spectrum, 13JUN2014](#)

Here's a TED Talk from Robert Full, discussing robots inspired by the amazing biomechanics of cockroaches.

Tags: Autonomous systems & robotics

BIOTECHNOLOGY**University of Tennessee discoveries could help neutralize chemical weapons**[e! Science News, 16JUN2014](#)

An international team of researchers (USA, France) are a step closer to creating a prophylactic drug that would neutralize the deadly effects of chemical weapons. Their study focuses on engineering enzymes that catalyze the hydrolysis of nerve agents as a prophylactic approach to diminishing their toxic effects.

Tags: Biotechnology

Synthetic biology: Missing the point[Nature News, 12JUN2014](#)

Researchers warn that if environmental groups and others exaggerate the risks of synthetic biology it could promote over-regulation, which he says happened for genetically modified organisms.

Tags: Biotechnology, Synthetic biology

Genes found in nature yield 1918-like virus with pandemic potential[Science Daily, 11JUN2014](#)

An international team of researchers (USA, UK, Japan) identified eight genes from influenza viruses isolated from wild ducks that possessed remarkable genetic similarities to the genes that made up the 1918 pandemic flu virus. The team used reverse genetics methods to generate a virus that differed from the 1918 virus by only 3 percent of the amino acids that make the virus proteins. [TECHNICAL ARTICLE](#)

Tags: Biotechnology, Biology

Humans climb like geckos using bio-inspired climbing technology[Science Daily, 11JUN2014](#)

DARPA's Z-Man program ascent involved a 218-pound climber ascending and descending 25 feet of glass, while also carrying an additional 50-pound load in one trial, with no climbing equipment other than a pair of hand-held, gecko-inspired paddles. A novel polymer microstructure technology was used in those paddles.

Tags: Biotechnology, Government S&T

Nanotube forests drink water from arid air[PhysOrg.com, 11JUN2014](#)

Researchers at Rice University found a way to mimic the Stenocara beetle which survives in the desert by stretching its wings to capture and drink water molecules from the early morning fog. They modified carbon nanotube forests giving the nanotubes a superhydrophobic bottom and a hydrophilic top. The forest attracts water molecules from the air and traps them inside. [TECHNICAL ARTICLE](#)

Tags: Biotechnology, Biomimetics

COMMUNICATIONS TECHNOLOGY**Innovative millimeter wave communications introduced**[Science Daily, 10JUN2014](#)

Wireless data connections that exploit millimetre wave radio spectrum (30GHz to 300GHz) are expected to be used in worldwide 5G networks from 2020. Researchers in the UK will demonstrate their innovative work at the Small Cells World Summit in London.

Tags: Communications Technology, S&T UK

CYBER SECURITY**Buy lunch, pay with your hand: Vein scanning technique**[Science Daily, 12JUN2014](#)

A group of graduate students in Sweden developed existing vein scanning technology for making payments. Every individual's vein pattern is completely unique, so there is no way of committing fraud with this system. There are currently 15 stores and restaurants mainly around Sweden's Lund University campus that use the terminals, with 1,600 active users.

Tags: Cyber security, S&T Sweden

“The most significant event of the nineteenth century will be judged as Maxwell’s discovery of the laws of electrodynamics.” RICHARD FEYNMAN

ENERGY

Record-Breaking Solar Cell Points the Way to Cheaper Power

MIT Technology Review, 13JUN2014

The new design developed by Panasonic prevents trapping of electrons which decreases current and voltage by applying thin films of silicon to the front and back of the silicon wafer. The new cell converts 25.6 percent of the energy in sunlight into electricity, edging past the long-standing record of 25 percent.

Tags: Energy, Breakthrough technology

Charging portable electronics in 10 minutes: New architecture for lithium-ion battery anodes far outperform the current standard

Science Daily, 10JUN2014

UC Riverside researchers developed a novel structure of three-dimensional silicon decorated cone-shaped carbon nanotube clusters architecture via chemical vapor deposition and inductively coupled plasma treatment. Potentially the new technique will result in a 63 percent increase of total cell capacity and a battery that is 40 percent lighter and smaller.

Tags: Energy, Battery

INFORMATION TECHNOLOGY

Thermal Camera Turns Many Things into Interactive Surfaces

MIT Technology Review, 13JUN2014

A company in Germany is experimenting with Thermal Touch which detects traces of heat left behind when you touch something. The technology combines two kinds of cameras. A thermal camera detects the residual heat from a touch. Simultaneously, a camera that registers visible light and determines the location of the object being touched. Company developed software can map that touch on the object in three dimensions.

Tags: Information Technology, S&T Germany

New computer program aims to teach itself everything about any visual concept

Science Daily, 12JUN2014

Researchers at the University of Washington have created a fully automated computer program called Learning Everything about Anything, or LEVAN. The program searches millions of books and images on the Web to learn all possible variations of a concept, then displays the results to users as a comprehensive, browsable list of images, helping them explore and understand topics quickly in great detail.

Tags: Information Technology

MATERIALS SCIENCE

Breakthrough for information technology using Heusler materials: May lead to very high performance spintronic components

Science Daily, 13JUN2014

An international team of researchers (Germany, Czech Republic) has directly observed 100 percent spin polarization of a Heusler compound. Heusler alloys are composed of several metallic elements arranged in a lattice structure. They are among the materials that can be potentially used for ever smaller data storage components with ever greater storage capacity. The potential applications include hard disk reader heads and non-volatile storage elements. [TECHNICAL ARTICLE](#)

Tags: Materials science, Breakthrough technology

Researchers design circuits capable of functioning at temperatures greater than 650 degrees Fahrenheit

Nanowerk, 12JUN2014

Researchers at the University of Arkansas have designed integrated circuits that can survive at temperatures greater than 350 degrees Celsius. The ruggedness allows these circuits to be placed in locations where standard silicon-based parts can't survive. Higher performance was achieved by combining silicon carbide with wide temperature design techniques.

Tags: Materials science

Creating a water layer for a clearer view

Science Daily, 11JUN2014

Researchers in Singapore have invented a new technology, CleanClear, which is a durable and permanent ceramic coating that is transparent and superhydrophilic. This creates a layer of water that prevents fogging on glass or plastic surfaces, and keeps surfaces cleaner for a longer period of time.

Tags: Materials science

New composite protects from corrosion at high mechanical stress

Science Daily, 11JUN2014

A new composite material developed by researchers in Germany can be applied by spraying and cures at 150-200°C. The protective particles arrange themselves like roof tiles resulting in a self-organized, highly structured barrier. The protective layer is just a few micrometers thick and prevents penetration by gases, electrolytes and aggressive aqueous solutions. It is suitable for steels, metal

continued...

alloys and metals such as aluminum, magnesium and copper.

Tags: Materials science, S&T Germany

Technology using microwave heating may impact electronics manufacturing

[Science Daily, 10JUN2014](#)

Researchers at Oregon State University have successfully shown that a continuous flow reactor can produce high-quality nanoparticles by using microwave-assisted heating. According to the researchers, the technique should work at commercial level. It could have a significant impact on the production of cell phones, televisions, counterfeit-proof money, as well as improved solar energy systems. [TECHNICAL ARTICLE](#)

Tags: Materials science

Designing ion 'highway systems' for batteries

[Science Daily, 09JUN2014](#)

Researchers at Northwestern University have married two traditional theories in materials science that can explain how the charge dictates the structure of the material. This opens the door for many applications, including a new class of batteries. [TECHNICAL ARTICLE](#)

Tags: Materials science, Battery

FEATURED RESOURCE

Digital Trends

Digital Trends helps their audience make informed decisions that allow them to maximize the potential of technology and help integrate it into to everyday life. [RSS](#)

MICROELECTRONICS

A faster path to optical circuits

[PhysOrg.com, 17JUN2014](#)

An international team of researchers (Switzerland, USA, Italy) has developed a novel method to design, simulate and optimize PCNs (photonic crystal nanocavities). They applied it to one of the most common PCN types used widely in commercial optical circuits. The goal was to maximize the length of time the nanocavity can hold a photon before it escapes. The research will considerably speed up the development of optical circuits. [TECHNICAL ARTICLE](#)

Tags: Microelectronics

Novel process allows production of the entire circuitry on touchscreens in one step

[Science Daily, 11JUN2014](#)

Researchers in Germany have developed a novel process based on photometallization: under exposure

to UV light, and acting in conjunction with a photoactive layer, colourless silver compounds turn into electrically conductive silver. The silver compound can be applied in the form of tracks or other structures to plastic films or glass by various methods. Tracks of various sizes, down to the smallest size of a 1000th of a millimetre, can be created in this way.

Tags: Microelectronics, S&T Germany

NEUROSCIENCE

Synchronized brain waves enable rapid learning

[Science Daily, 12JUN2014](#)

The human mind can rapidly absorb and analyze new information as it flits from thought to thought. Researchers at MIT found that as monkeys learn to categorize different patterns of dots, two brain areas involved in learning—the prefrontal cortex and the striatum—synchronize their brain waves to form new communication circuits.

[TECHNICAL ARTICLE](#)

Tags: Neuroscience

PHOTONICS

Trapping light: A long lifetime in a very small place

[Science Daily, 16JUN2014](#)

An innovative design approach, which mimics evolutionary biology, allowed researchers at the University of Rochester to create a silicon nanocavity that allows light to be trapped longer than in other similarly-sized optical cavities, a 10-fold improvement. Trapping light allows easier manipulation and coupling to other devices and makes it easier to study light at its fundamental level, that is, at the state when light behaves as a particle. [TECHNICAL ARTICLE](#)

Tags: Photonics

QUANTUM SCIENCE

Pairing up single atoms in silicon for quantum computing

[PhysOrg.com, 16JUN2014](#)

Researchers in Australia have observed the unique quantum behaviour of a pair of spins in silicon and designed a new method to use them for “2-bit” quantum logic operations. These milestones bring researchers a step closer to building a quantum computer. [TECHNICAL ARTICLE 1, 2](#)

Tags: Quantum science, S&T Australia

Viewing deeper into the quantum world

[Science Daily, 11JUN2014](#)

Previously, researchers in Spain experimentally demonstrated a proof-of-principle nonlinear interferometer that exploited interactions between photons to measure the tiny magnetization of a cloud of laser-cooled atoms. Now they

continued...

have demonstrated that such a nonlinear interferometer can outperform an equivalent linear measurement, confirming the proposed theoretical predictions.

TECHNICAL ARTICLE

Tags: Quantum science

Weird 'magic' ingredient for quantum computing: Contextuality

Science Daily, 11JUN2014

The term magic refers to a particular approach to building noise-resistant quantum computers known as magic-state distillation. An international team of researchers (Ireland, Canada) has identified these magic states as contextual which enables researchers to clarify the trade-offs involved in different approaches to building quantum devices and design new algorithms that exploit the special properties of these magic states more fully.

TECHNICAL ARTICLE

Tags: Quantum science, S&T Canada

S&T POLICY

Open access for Chinese publications within 12 months

NOST (China), 13JUN2014

According to the Chinese Academy of Sciences all articles that are based on governmental Science and Technology programs, as well as all publicly funded projects, should become accessible to everyone within 12 months after publication.

Tags: S&T policy, S&T China

SENSORS

Could wireless replace wearables?

MIT News, 12JUN2014

Researchers at MIT have developed a wireless technology that measures heart rate and breathing through walls. It has applications for personal health, baby monitors, and law enforcement. TECHNICAL ARTICLE

Tags: Sensors

Chemical sensor on a chip created to test chemical composition of liquids

Science Daily, 11JUN2014

Researchers in Austria have designed quantum cascade lasers and light detectors that are created by the same production process. The gap between laser and detector is only 50 micrometres. It is bridged by a plasmonic waveguide made of gold and silicon nitride. This new approach allows for the simple and cheap production of tiny sensors for many different applications. TECHNICAL ARTICLE

Tags: Sensors

Manipulating and detecting ultrahigh frequency sound waves: 1,000 times higher resolution ultrasound images possible

Science Daily, 11JUN2014

Researchers at the DOE's Lawrence Berkeley Laboratory have demonstrated a technique for detecting and controlling ultrahigh frequency sound waves at the nanometer scale. Being able to generate and detect phonon modes with different symmetries or spatial distributions in a structure is a step towards potential applications of ultrahigh frequency acoustic phonons. TECHNICAL ARTICLE

Tags: Sensors, Government S&T

Nanotubes Capture Terahertz Radiation

IEEE Spectrum, 11JUN2014

A new type of detector for terahertz radiation developed by researchers at Rice University made from carbon nanotubes and requiring no power to operate could usher in better airport scanners, new medical imagers, and more sensitive instruments for inspecting food and machine parts. The terahertz photons are caught by a small but visible array, about 100 μm wide and roughly a millimeter long. TECHNICAL ARTICLE

Tags: Sensors, Terahertz technology ■

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