



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[Record quantum entanglement of multiple dimensions: Two Schrödinger cats which could be alive, dead, or in 101 other states simultaneously](#)

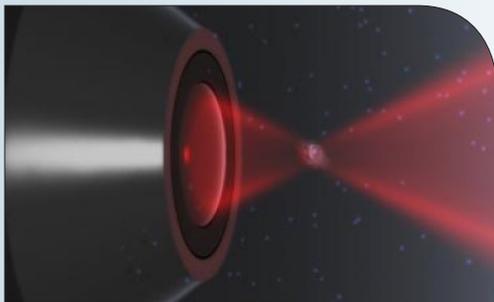
[Science Daily, 27APR2014](#)

An international team of researchers (Austria, Spain) has managed to create an entanglement of 103 dimensions with only two photons. The discovery could represent a great advance toward the construction of quantum computers with much higher processing speeds than current ones and a better encryption of information. [TECHNICAL ARTICLE](#)

Tags: Quantum science, Featured Article

[Nanoparticle trapped with laser light temporarily violates second law of thermodynamics](#)

[Science Daily, 31MAR2014](#)



This is an artistic impression of the nanoparticle in a laser trap. Credit: Iñaki Gonzalez and Jan Gieseler

An international team of researchers (Austria, Spain, Switzerland) observed a tiny glass sphere in a trap of laser light effectively releasing heat to the hotter surroundings rather than absorbing heat. The theory derived by the researchers to analyze the experiment confirms the emerging picture on the limitations of the second law on the nanoscale. [TECHNICAL ARTICLE](#)

Tags: Materials science, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[Significant progress toward creating 'benchtop human' reported](#)

[Science Daily, 26APR2014](#)

Researchers at Vanderbilt University have successfully developed and analyzed a liver human organ construct that responds to exposure to a toxic chemical much like a real liver.

Tags: Advanced manufacturing, Biotechnology

[Engineers print a functioning 1.5m-wide prototype unmanned aerial vehicle](#)

[PhysOrg.com, 28MAR2014](#)

Researchers in the UK have successfully printed a 1.5m-wide prototype unmanned aerial vehicle for a research project looking at 3D printing of complex designs. The polymer craft could form the basis of cheap and potentially disposable UAVs that could be built and deployed in remote situations potentially within as little as 24 hours.

Tags: Advanced manufacturing, Autonomous Systems & Robotics, S&T UK

ADVANCED MATERIALS

[Controlling electron spins by light](#)

[Science Daily, 27APR2014](#)

Topological insulators are interesting and promising candidates for novel devices in information technology. A particularly innovative approach is to try and influence the electron spin at the surface in such devices by light. Researchers in Germany have discovered a method to alter the spin at the surface of topological insulators. To this end, the researches performed experiments with light of various energies or wavelengths. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, S&T Germany

New material offers angular control over light[Physics World, 27APR2014](#)

A new material that filters light according to its direction of travel has been developed by physicists in the US and China. Made of alternating layers of two different transparent materials, the structure is just 8 μm thick and offers a new and extremely simple way of controlling the direction in which light propagates. According to its inventors, the material could be used in a range of applications, from photography to solar energy.

Tags: Advanced materials, Photonics

Molecular chain makes tiniest vibrating beam[Nanotechweb, 28MAR2014](#)

Researchers in Austria have made the smallest ever nanomechanical resonator from just four to 12 individual weakly interacting molecules. The oscillating cantilever is not only of interest for fundamental studies in physics but could also be used to sense single atoms or molecules.

TECHNICAL ARTICLE

Tags: Advanced materials, Sensors

Collective strength: enhancing sensors[Nanotechweb, 27MAR2014](#)

Researchers in the UK designed a metamaterial structure comprising an array of gold nanorods coated with palladium. When hydrogen was present at a concentration of just 2%—half the percentage that could be explosive—the amount of light transmitted and reflected by the structures changed by up to 30% and 40%. **TECHNICAL ARTICLE**

Tags: Advanced materials, S&T UK

AUTONOMOUS SYSTEMS & ROBOTICS**Video Friday: Squishy Quadrupeds, Fotokite Drone, and Robots From the 1990s**[IEEE Spectrum, 28APR2014](#)

The Glaucus is a quadruped robot (of sorts) that's unique for a few reasons. It doesn't have any actuators, but instead relies on coordinated inflating and deflating of air muscles for locomotion, resulting in a boneless, completely soft-bodied robot. Also, you can 3D print molds and then cast the robot completely out of silicon, no assembly required.

Tags: Autonomous systems & robotics

BIG DATA**Data mining disaster: Computer technology can mine data from social media during disasters**[Science Daily, 27APR2014](#)

Researchers in the UK found there are much broader applications for data mining, such as constructing situational awareness and real-time threat assessment. Earlier applications were focused on specific problems, such as modeling the dispersion by wind of plumes—whether from a chemical plant leak, fire or nuclear incident—and monitoring rescue robots. **TECHNICAL ARTICLE**

Tags: Big data, S&T UK

BIOTECHNOLOGY**Self-healing engineered muscle grown in the laboratory**[Science Daily, 01MAY2014](#)

A study conducted at Duke University tested the bioengineered muscle by literally watching it through a window on the back of a living mouse. The novel technique allowed for real-time monitoring of the muscle's integration and maturation inside a living, walking animal. **TECHNICAL ARTICLE**

TECHNICAL ARTICLE

Tags: Biotechnology

COMMUNICATIONS TECHNOLOGY**'Optical oracle' could quickly solve complex computing problems**[PhysOrg.com, 31MAR2014](#)

An international team of researchers (Singapore, UK, Spain) have demonstrated the proof-of-principle that a global network of optical fiber offers an untapped computing potential due to its ability to act as an "optical oracle" that can solve the Hamiltonian path problem.

TECHNICAL ARTICLE

Tags: Communications Technology, Mathematics

'Electronic skin' equipped with memory[Nature News, 30MAR2014](#)

Researchers in Switzerland have created a wearable device that is as thin as a temporary tattoo and can store and transmit data about a person's movements, receive diagnostic information and release drugs into skin.

Tags: Communications Technology, S&T Switzerland

CYBER SECURITY**Study Shows Flawed U.S. Encryption Standard Could Be Broken in Seconds**[MIT Technology Review, 29MAR2014](#)

According to the first in-depth study, an attacker that had "backdoored" the standard could easily defeat encryption systems that use the now deprecated Dual EC random number generator. The study was carried out by researchers from Johns Hopkins University, the University of Wisconsin, the Technical University of Eindhoven, the University of Illinois at Chicago, and the University of California San Diego.

Tags: Cyber security

ENERGY**Engineered bacteria produce biofuel alternative for high-energy rocket fuel**[Science Daily, 26APR2014](#)

Researchers at the Georgia Institute of Technology have engineered a bacterium to synthesize pinene, a hydrocarbon produced by trees that could potentially

continued...

“But the real glory of science is that we can find a way of thinking such that the law is evident.” RICHARD FEYNMAN

replace high-energy fuels, such as JP-10, in missiles and other aerospace applications. By inserting enzymes from trees into the bacterium, scientists have boosted pinene production six-fold over earlier bioengineering efforts.

TECHNICAL ARTICLE

Tags: Energy

Generator uses the human body as an electrode to power portable electronics

PhysOrg.com, 26APR2014

Researchers in China have replaced the grounded electrode with a “body contact electrode.” They have demonstrated that patting the phone with the palm of the hand or tapping the phone with a finger causes electrons to be exchanged between human skin and STEG (single-friction-surface triboelectric generator) material. After repeated patting/tapping, electric charge moves back and forth between the induction electrode and the charged skin. TECHNICAL

ARTICLE

Tags: Energy, S&T China

New magnetic materials for extracting energy from tides

Science Daily, 25APR2014

The objective of the MAGNETIDE project, funded by the EU, is to develop a new type of generator that transforms the mechanical energy produced by the movement of the tides into electric energy. Researchers in Spain have modified the generator’s design so that components manufactured using PIM, Powder Injection Moulding, could be installed. This would reduce the cost of these systems and increase their efficiency by up to 30%, according to the scientists’ calculations. TECHNICAL ARTICLE

Tags: Energy, S&T EU

A promising concept on the path to fusion energy

PhysOrg.com, 31MAR2014

The Quasi-Axisymmetric Stellarator Research (QUASAR) experiment represents the first of a new class of fusion reactors at the DOE’s Princeton Plasma Laboratory (PPPL) based on the innovative theory of quasi-axisymmetry, which makes it possible to design a magnetic bottle that combines the advantages of the stellarator with the more widely used tokamak design. TECHNICAL ARTICLE

Tags: Energy, Government S&T

Cheap, better-performing lithium-ion batteries with nanowires

Nanowerk, 30MAR2014

Researchers at the University of Southern California developed a cost-effective silicon anode with a stable capacity above 1100 mAh/g for extended 600 cycles, making their anode nearly three times more powerful and longer lasting than a typical commercial anode.

TECHNICAL ARTICLE

Tags: Energy, Battery

Rainbow-catching waveguide could revolutionize energy technologies

EurekAlert, 27MAR2014

Researchers at the State University of New York, Buffalo, have designed a multilayered waveguide taper which is made of ultrathin layers of metal, semiconductors and/or insulators. The tapers absorb light in metal dielectric layer pairs. By adjusting the thickness of the layers and other geometric parameters, the tapers can be tuned to different frequencies including visible, near-infrared, mid-infrared, terahertz and microwaves. TECHNICAL ARTICLE

Tags: Energy, Advanced materials

ENVIRONMENTAL SCIENCE

New laser technology could divert lightning strikes

PhysOrg.com, 01MAY2014

Researchers at the University of Arizona and the University of Central Florida have developed a technology capable of sending high-intensity laser beams through the atmosphere much farther than was possible before. The research is still in the laboratory phase, but could one day guide electrical discharges, such as lightning, away from buildings. TECHNICAL ARTICLE

Tags: Environmental science

IMAGING TECHNOLOGY

Breakthrough in creating invisibility cloaks, stealth technology

Science Daily, 31MAR2014

Researchers at the University of Central Florida were able to develop a larger swath of multilayer 3-D metamaterial operating in the visible spectral range. They accomplished this feat by using nanotransfer printing, which can potentially be engineered to modify surrounding refractive index needed for controlling propagation of light. TECHNICAL

ARTICLE

Tags: Imaging technology, Photonics

continued...

Ultra tiny camera has no lens - uses algorithm to develop pictures

PhysOrg.com, 28MAR2014

The camera developed by a company in California is just a very tiny chip (CMOS imager) embedded in a piece of glass. The imager reads the light that is received, processes it using an algorithm and converts it into a recognizable image. What's amazing is that the etched pattern on the glass and the chip are both roughly the size of a period at the end of a sentence. [TECHNICAL ARTICLE](#)

Tags: *Imaging technology*

FEATURED RESOURCE

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INFORMATION TECHNOLOGY

New Approach Could Stop Websites from Leaking or Stealing Your Data

MIT Technology Review, 27MAR2014

Researchers at MIT have developed a system called Mylar for building Web services. Mylar's design has code running inside a person's browser to take on most of the processing and presenting of information—work that a conventional service would do on its servers. It also includes some new cryptographic tricks that allow a server to do useful things with user data without having to descramble it.

[TECHNICAL ARTICLE](#)

Tags: *Information Technology*

MATERIALS SCIENCE

Nanofiber paper filter removes viruses

Nanowerk, 31MAR2014

Researchers in Sweden report a design of a paper filter which is capable of removing virus particles with the efficiency matching that of the best industrial virus filters. The reported paper filter, which is manufactured according to the traditional paper making processes, consists of 100 percent high purity cellulose nanofibers directly derived from nature. [TECHNICAL ARTICLE](#)

Tags: *Materials science, S&T Sweden*

Physicists split and collide ultracold atom clouds

Nanowerk, 31MAR2014

Researchers in New Zealand have pushed the frontiers of quantum technology by developing a steerable 'optical tweezers' unit that uses intense laser beams to precisely split minute clouds of ultracold atoms and to smash them

together. Potential applications include new tools for probing microscopic structures or for sensors that can map minute variations in magnetic fields.

Tags: *Materials science, Particle physics*

Bioceramic armor—Tough as nails, yet clear enough to read through

Nanowerk, 30MAR2014

The shells of a sea creature, the mollusk *Placuna placenta*, are not only exceptionally tough, but also clear enough to read through. Now, researchers at MIT have analyzed these shells to determine exactly why they are so resistant to penetration and damage—even though they are 99 percent calcite, a weak, brittle mineral. [TECHNICAL ARTICLE](#)

Tags: *Materials science*

Heat-conducting nanofiber polymer cools hot electronic devices at 200 degrees Celsius

Nanowerk, 30MAR2014

By harnessing an electropolymerization process to produce aligned arrays of polymer nanofibers, researchers at the Georgia Institute of Technology have developed a thermal interface material able to conduct heat 20 times better than the original polymer. The modified material can reliably operate at temperatures of up to 200 degrees Celsius.

[TECHNICAL ARTICLE](#)

Tags: *Materials science*

Using electron beams to encode data in nanocrystals

PhysOrg.com, 26MAR2014

Researchers in Singapore developed a theoretical model, which revealed that an increase in electron density in barium titanate crystal produced the same polarization pattern that they observed with TEM. They also calculated that the radial electric field created by an electron beam could generate other distinctive features of this pattern. The discovery serves as a warning that electron beam techniques could alter the very domains that researchers are seeking to measure. [TECHNICAL ARTICLE](#)

Tags: *Materials science, Information technology*

MICROELECTRONICS

Explaining interactions between light, heat, and charge carriers in silicon photonic microresonator

Nanowerk, 28APR2014

New analysis done by researchers from Northwestern University and NIST includes simple equations to provide physical intuition and scaling rules that can be used to design new chip-scale photonic devices, including optically-driven oscillators and switches with potential applications as optical components in computing and communication systems. [TECHNICAL ARTICLE](#)

Tags: *Microelectronics*

continued...

NEUROSCIENCE

Information processing demonstrated using a light-based chip inspired by our brain[Science Daily](#), 28APR2014

Researchers in Belgium have implemented a small (16 nodes) neural network directly in hardware, using a silicon photonics chip. Such a chip is fabricated using the same technology as traditional computer chips, but uses light rather than electricity as the information carrier. This approach has many benefits including the potential for extremely high speeds and low power consumption.

TECHNICAL ARTICLE*Tags: Neuroscience*

PHOTONICS

New way to filter light: May provide first directional selectivity for light waves[Science Daily](#), 27APR2014

Researchers at MIT have produced a system that allows light of any color to pass through only if it is coming from one specific angle; the technique reflects all light coming from other directions. This new approach could ultimately lead to advances in solar photovoltaics, detectors for telescopes and microscopes, and privacy filters for display screens. **TECHNICAL ARTICLE**

*Tags: Photonics***First phononic crystal that can be altered in real time**[PhysOrg.com](#), 31MAR2014

Using an acoustic metadvice that can influence the acoustic space and can control any of the ways in which waves travel, researchers in the UK have demonstrated that it is possible to dynamically alter the geometry of a three-dimensional colloidal crystal in real time.

TECHNICAL ARTICLE*Tags: Photonics, Microelectronics, S&T UK*

QUANTUM SCIENCE

Ultrabright lasers help switch single photons[PhysOrg.com](#), 03MAR2014

In the search for a single photon source, researchers in Australia and France have achieved a major step towards a turn-key source of individual, precisely tailored photons from an integrated optical chip. The discovery advances quantum technologies including simulation of complex molecules, truly secure communication and ultimately quantum computation. **TECHNICAL ARTICLE**

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

SCIENCE WITHOUT BORDERS

Dark energy hides behind phantom fields[PhysOrg.com](#), 26MAR2014

Researchers from Spain and Greece used data from Planck of the European Space Agency (ESA) and Wilkinson Microwave Anisotropy Probe (WMAP) of NASA satellites to demonstrate that the behaviour of dark energy does not need to resort to either quintessence or phantom energy in order to be explained. **TECHNICAL ARTICLE**

Tags: Science without borders ■**ABOUT THIS PUBLICATION**

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