



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

[Advanced manufacturing \(1\)](#)

[Communications technology \(3\)](#)

[Materials science \(5\)](#)

[S&T policy \(1\)](#)

[Advanced materials \(5\)](#)

[Energy \(4\)](#)

[Neuroscience \(1\)](#)

[Science without borders \(3\)](#)

[Autonomous systems
& robotics \(1\)](#)

[Environmental science \(1\)](#)

[Photonics \(1\)](#)

[Sensors \(1\)](#)

[Information technology \(1\)](#)

[Quantum science \(4\)](#)

FEATURE ARTICLES

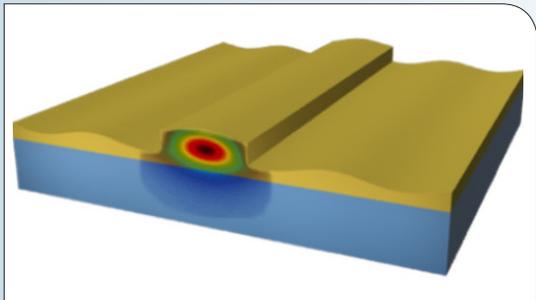
[Engineers build time cloak that hides messages in laser light](#)

[PhysOrg.com, 01DEC2014](#)

Researchers at Purdue University have improved their previous cloaking approach to the extent that it allows data to be time cloaked for transmission, and uncloaked by those that know how, while keeping the data cloaked (hidden) from everyone else's perspective. [TECHNICAL ARTICLE](#)

Tags: Communications Technology, Featured Article

[Engineers make sound loud enough to bend light on a computer chip: Device could improve wireless communications systems](#)



The figure illustrates a sound wave passing across an integrated optical waveguide, overlaid with a color map of the light field in it. Credit: Image courtesy of University of Minnesota

material with acoustic devices in order to attain strong interaction between light and sound waves. They used nanofabrication technology to make arrays of electrodes with a width of only 100 nanometers to excite sound waves higher than 10 GHz, the frequency used for satellite communications. The researchers plan to use sound waves as the information carriers for quantum computing. [TECHNICAL ARTICLE](#)

Tags: Communications Technology, Featured Article

[Science Daily, 26NOV2014](#)

Researchers at the University of Minnesota integrated optical circuits in the same layer of

ADVANCED MANUFACTURING

[Study shows way to design 'digital' metamaterials](#)

[PhysOrg.com, 02DEC2014](#)

Researchers at the University of Pennsylvania show that a metamaterial with a given permittivity can be designed out of any two materials, called "metamaterial bits," so long as the permittivity of one of the materials is positive and the other is negative. The finding simplifies figuring out the necessary composition and internal structure of metamaterials to create unusual effects such as light-bending invisibility cloaks and flat lenses. [TECHNICAL ARTICLE](#)

Tags: Advanced manufacturing, Advanced materials

ADVANCED MATERIALS

[New chemical sponge has potential to lessen the carbon footprint of oil industry](#)

[PhysOrg.com, 02DEC2014](#)

An international team of researchers (UK, China) has discovered a porous material that works like a chemical sponge to separate a number of important gases from mixtures generated during crude oil refinement. The new technique has potential to revolutionise the oil industry by significantly reducing carbon emissions and making the process more environmentally friendly. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

[New material makes water and oil roll off](#)

[Science Daily, 28NOV2014](#)

Developed by researchers in Germany, both water and oil droplets roll off the new class of highly flourinated super-repellent polymers called "flouropore." Fundamental research in this area is aimed among others at making use of this new type of material for universal protective coatings.

Tags: Advanced materials, S&T Germany

continued...

[BACK TO TOP](#)

Supersonic bullets test graphene's strength

Nanotechweb, 28NOV2014

A team of US researchers (Rice University, U Mass Amherst) fired tiny silica spheres at graphene sheets and compared the kinetic energy of the spheres before and after they had penetrated the sheets. They found that graphene sheets are eight to 10 times better than steel when it comes to absorbing impacts from microbullets. The technique they employed could be used to test the strength and toughness of other nanomaterials as well. [TECHNICAL ARTICLE](#)

Tags: *Advanced materials***High-tech mirror beams heat away from buildings into space**

Science Daily, 26NOV2014

Researchers at Stanford University have developed a material made of seven layers of silicon dioxide and hafnium oxide of uneven thickness on top of a thin layer of silver. Its internal structure is tuned to radiate infrared rays at a frequency that lets them pass into space without warming the air near the building. This photonic approach gives the ability to finely tune both solar reflection and infrared thermal radiation. The invention could reduce demand for electricity. [TECHNICAL ARTICLE](#)

Tags: *Advanced materials***New plastic that disappears when you want it to**

Science Daily, 25NOV2014

In their proof of concept experiment, researchers at North Dakota State University used fructose, found commonly in fruit, to create a solution of molecules, which was then converted to a polymer. By exposing it to ultraviolet light at 350 nanometers for three hours, the plastic was degraded and reduced back to the soluble building block molecules from which it began. [TECHNICAL ARTICLE](#)

Tags: *Advanced materials***AUTONOMOUS SYSTEMS & ROBOTICS****An 'eel-lectrifying' future for autonomous underwater robots**

Science Daily, 26NOV2014

Researchers in Singapore have developed and built a prototype for an eel-like robotic fish. Mechanically, this robotic fish consists of N-links and N-1 joints, and is controlled by the torques applied to the joints. It was designed to move forward, and backward, as well as turnaround through different reference inputs driven by a three-dimensional coupled Andronov-Hopf oscillators, an artificial neural network, and an outer amplitude modulator. [TECHNICAL ARTICLE](#)

Tags: *Autonomous systems & robotics***COMMUNICATIONS TECHNOLOGY****New research could transform high speed optical network**

PhysOrg.com, 02DEC2014

Researchers in the UK propose using the concept of tunable optical antennas and antenna arrays for dynamic beam shaping and steering utilized in free-space optical inter/intra chip interconnects. Tunability of optical antennas is achieved by using phase change materials (PCMs). [TECHNICAL ARTICLE](#)

Tags: *Communications Technology, S&T UK***ENERGY****Can capacitors in electrical circuits provide large-scale energy storage?**

PhysOrg.com, 02DEC2014

Researchers in Japan have shown that the right combination of resistors and capacitors can allow electrical circuits to meet two key requirements of an energy storage device: quick charging and long-term discharging. Using capacitors as energy storage devices in circuits has potential applications for hybrid electric vehicles, backup power supplies, and alternative energy storage. [TECHNICAL ARTICLE](#)

Tags: *Energy, S&T Japan***Lengthening life of high capacity silicon electrodes in rechargeable lithium batteries with novel rubber-like coating**

Science Daily, 02DEC2014

Researchers at DOE's Pacific Northwest National Laboratory found that they could cover silicon nanoparticles with a rubber-like coating made from aluminum glycerol. The coated silicon particles lasted at least five times longer—uncoated particles died by 30 cycles, but the coated ones still carried a charge after 150 cycles. [TECHNICAL ARTICLE](#)

Tags: *Energy, Advanced materials, Government S&T***Graphene could be used to filter fuel out of thin air**

Science Alert (Australia), 28NOV2014

Researchers in the UK have found that graphene isn't just incredibly strong and light—it also allows protons to pass through it. This means that graphene could one day be used to build more efficient fuel cells by being incorporated into proton-conducting membranes—crucial elements of fuel cell technology.

Tags: *Energy, S&T UK*

“Mystery creates wonder and wonder is the basis of man’s desire to understand.”

NEIL ARMSTRONG

Shaping the future of energy storage with conductive clay

Science Daily, 26NOV2014

Researchers at Drexel University have invented clay, which is both highly conductive and can easily be molded into a variety of shapes and sizes. Both the physical properties of the clay, consisting of two-dimensional titanium carbide particles, as well as its performance characteristics, seem to make it an exceptionally viable candidate for use in energy storage devices like batteries and supercapacitors.

TECHNICAL ARTICLE

Tags: Energy, Materials science

ENVIRONMENTAL SCIENCE

Geoengineering our climate is not a ‘quick fix’

Science Daily, 25NOV2014

According to recent studies by researchers in the UK, the deliberate large-scale intervention in the Earth’s climate system is not a “quick fix” for global warming. Geoengineering will be much more expensive and challenging than previous estimates suggest and any benefits would be limited.

TECHNICAL ARTICLE

Tags: Environmental science

INFORMATION TECHNOLOGY

Brain inspired data engineering

Science Daily, 27NOV2014

Spain launches a pioneering research project on BRAin inspired Data Engineering (BRADE-CM). It is a multi-tiered research approach spanning neuroscience, the development of imaging instrumentation, the modeling of complex systems and networks, and the design of information processing ICT systems.

Tags: Information Technology, S&T Policy

MATERIALS SCIENCE

‘Giant’ charge density disturbances discovered in nanomaterials

Science Daily, 26DEC2014

Researchers in Germany have discovered a combination of materials that strengthens Friedel oscillations and bundles them, as if with a lens, in different directions. With a range of 50 nanometers, these “giant anisotropic charge density oscillations” are many times greater than normal and open up new possibilities in the field of nanoelectronics to exchange or filter magnetic information.

TECHNICAL ARTICLE

Tags: Materials science, S&T Germany

Transmission mechanism using magnetic levitating gear

Science Daily, 30NOV2014

Under a EU research project called MAGDRIVE, researchers in Spain are developing a magnetic gear reducer. Unlike a conventional gear reducer, this transmission is produced without contact between the pieces. It prevents friction and wear and makes lubrication unnecessary. It can be applied in space travel and exploration but has also been adapted for use in other areas, such as the railroad and aircraft industries.

Tags: Materials science

Heat-conducting plastic: 10 times better than conventional counterparts

Science Daily, 26NOV2014

The spaghetti-like internal structure of most plastics makes it hard for them to cast away heat. Now a University of Michigan research team has made a plastic blend that conducts heat 10 times better than its conventional counterparts. The new material could lead to light, versatile, metal-replacement materials that make possible more powerful electronics or more efficient vehicles, among other applications.

TECHNICAL ARTICLE
Tags: Materials science, Advanced materials

The mysterious ‘action at a distance’ between liquid containers

Science Daily, 26NOV2014

The mysterious “action at a distance” observed in helium cooled to a very low temperature was attributed to quantum phenomena. The theoretical model of the phenomenon, developed by an international team of scientists (UK, Germany, Poland), suggests that this effect may also be present in other liquids—and in much more typical conditions. The most important requirement turns out to be the proximity of the phase transition. The phenomenon can affect experiments using microfluidic systems.

TECHNICAL ARTICLE

Tags: Materials science

Physicists predict fano resonance in lead-free relaxors: Discovery advances knowledge of poorly understood materials

Science Daily, 25NOV2014

An international team of researchers (China, Czech Republic, Canada, USA) predicts that a phenomenon known in physics as Fano resonance can exist in materials that are used in electronic devices. The discovery advances

continued...

the fundamental understanding of ferroelectric relaxors.

TECHNICAL ARTICLE

Tags: *Materials science*

NEUROSCIENCE

[Photons double up to make the invisible visible](#)

Nature News, 01DEC2014

A series of experiments, by an international team of researchers (USA, Poland, Switzerland, Norway), suggests that this little-known, puzzling effect could occur when pairs of infrared photons simultaneously hit the same pigment protein in the eye, providing enough energy to set in motion chemical changes that allow us to see the light.

Tags: *Neuroscience*

FEATURED RESOURCE

[IEEE Spectrum magazine](#)

This flagship publication of the IEEE is a monthly magazine for technology innovators, business leaders, and the intellectually curious. Spectrum explores future technology trends and the impact of those trends on society and business.

[RSS](#)

PHOTONICS

[New method to achieve ultra-narrow laser linewidth](#)

PhysOrg.com, 26NOV2014

Using the new method developed by researchers in China, Rayleigh backscattering can be collected in any waveguide structure and all wave bands to effectively compress a laser linewidth to merely hundreds of hertz, which could have a revolutionary impact in the field of laser technology. [TECHNICAL ARTICLE](#)

Tags: *Photonics, S&T China*

QUANTUM SCIENCE

[Possible read head for quantum computers](#)

Science Daily, 01DEC2014

Nitrogen-vacancy centers in diamonds could be used to construct vital components for quantum computers. But hitherto it has been impossible to read optically written information from such systems electronically. Using a graphene layer, an international team of researchers (Germany, Spain) has now implemented just such a read unit. The technique builds on a direct transfer of energy from nitrogen-vacancy centers in nanodiamonds to a neighboring graphene layer. [TECHNICAL ARTICLE](#)

Tags: *Quantum science*

[Vortex of electrons provides unprecedented information on magnetic quantum states in solids](#)

PhysOrg.com, 28NOV2014

An international team of researchers (Japan, Austria) has successfully measured free electron properties equivalent to those in solids for the first time using vortex electron beams formed by a transmission electron microscope. In combination with an external magnetic field, the parameters of the vortex beam, such as radius, could be set to correspond to the different Landau states. The technique enables the study of quantum physical properties of electrons in detail. [TECHNICAL ARTICLE](#)

Tags: *Quantum science*

[Scope of research on quantum computing narrowed: Characteristics of a universal simulator](#)

Science Daily, 27NOV2014

One of the difficulties in the field of quantum computers is understanding what criteria a quantum system should meet to be able to solve problems that are impossible for conventional computers. An international research team (USA, Italy, China, Germany, Singapore, UK) has just published a study that establishes a basic characteristic that universal quantum simulators should possess.

[TECHNICAL ARTICLE](#)

Tags: *Quantum science*

[Global quantum communications: No longer the stuff of fiction?](#)

Science Daily, 24NOV2014

Researchers in Poland have created a fully-functioning atomic memory with a simple reliable construction. It has numerous potential applications, including telecommunications. The main element of the memory device is a glass chamber 2.5 cm in diameter and 10 cm long, with rubidium-coated sides, filled with a noble gas. When the tube is heated gently, rubidium pairs fill the inside, with the noble gas restricting their movement and thereby reducing noise. [TECHNICAL ARTICLE](#)

Tags: *Quantum science, Communications Technology*

S&T POLICY

[UK unveils £120m quantum-technology hubs](#)

Physics World, 26NOV2014

The UK government has announced that four universities—Birmingham, Glasgow, Oxford and York—will serve as hubs in a £120m programme to explore the properties of quantum mechanics and how it can be used to develop new technologies. The four Quantum Technology Hubs will involve a total of 17 UK universities and 132 companies. Quantum technologies could support multi-billion-pound markets in the UK and globally.

Tags: *S&T policy, Quantum science, S&T UK*

continued...

SCIENCE WITHOUT BORDERS

Nature makes all articles free to view

Nature News, 01DEC2014

All research papers will be made free to read in a proprietary screen-view format that can be annotated but not copied, printed or downloaded. The policy also applies to 48 other journals in Macmillan's Nature Publishing Group. The policy comes as research funders are increasingly mandating that scientists make their papers free to read, download and reuse in various other ways.

Tags: Science without borders

The Long Road to Maxwell's Equations

IEEE Spectrum, 01DEC2014

An extraordinary amount of information about the world—the basic rules by which light behaves, current flows, and magnetism functions—can be boiled down to four elegant equations. It took nearly 25 years for a small group of physicists, themselves obsessed with the mysteries of electricity and magnetism, to put Maxwell's theory on solid footing.

Tags: Science without borders

Acoustic Scene Classification

arXiv, 13NOV2014

In this review article researchers in the UK evaluate human classification accuracy. The best performing algorithm achieves a mean accuracy that matches the median accuracy obtained by humans, and common pairs of classes are misclassified by both computers and humans. However, all acoustic scenes are correctly classified by at least some individuals, while there are scenes that are misclassified by all algorithms.

Tags: Science without borders, Artificial intelligence, S&T UK

SENSORS

Smart anti-icing system for rotor blades

PhysOrg.com, 01DEC2014

Under the EU project "Windheat," researchers in Germany divided the rotor blade into a variety of zones that were each finished with a carbon nanotube coating. Then, a separate ice detector is integrated into each individual CNT layer. If ice is detected, in a matter of seconds, the detectors switch on the heat element that supplies the corresponding CNT layer. Once the ice has melted, the heat is automatically switched off.

Tags: Sensors, Advanced materials, S&T EU, S&T Germany ■

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