



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[Electrical efficiency by engineering warmer superconductors with atom-by-atom control](#)

Science Daily, 12NOV2014

In their report, a team led by SLAC and Stanford University researchers explains why a thin layer of iron selenide superconducts at much higher temperatures when placed atop another material, which is called STO for its main ingredients strontium, titanium and oxygen. [TECHNICAL ARTICLE](#)

Tags: [Materials science](#), [Government S&T](#), [Featured Article](#)

[Twisted light waves sent across Vienna](#)

Science Daily, 11NOV2014

Researchers in Austria sent 16 different twisted configurations of a specific wavelength of light through a lens on top of a radar tower to a receiver 3 km away. A camera was used to capture the beams of light and an artificial neural network was deployed to reveal the pattern and remove any possible disturbances that may have been caused by air turbulence. After



The 3 kilometer free-space experiment was performed in the city of Vienna, from ZAMG (Zentralanstalt für Meteorologie und Geodynamik, Central Institute for Meteorology and Geodynamics) to our institute IQOQI. Picture of an alignment laser from IQOQI to ZAMG, captured at ZAMG.

Credit: [New Journal of Physics/IOP Publishing](#)

distinguishing and characterising the 16 different patterns, the researchers then encoded the light with real information. [TECHNICAL ARTICLE VIDEO](#)

Tags: [Communications technology](#), [Photonics](#), [Featured Article](#)

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[Engineers develop innovative process to print flexible electronic circuits](#)

Science Daily, 17NOV2014

Researchers in Singapore printed resistors, transistors and capacitors, the key components of a complex electronic circuit using non-toxic organic materials like silver nanoparticles, carbon and plastics on top of everyday flexible materials such as plastic, aluminium foil and even paper.

Tags: [Advanced manufacturing](#), [Flexible electronics](#)

[All the electronics that's fit to print](#)

Science Daily, 11NOV2014

New technology allows you to print electronic devices in the same way your inkjet printer prints a document or photo. Now researchers at Palo Alto Research Center have used this technique to build a portable X-ray imager and small mechanical devices.

Tags: [Advanced manufacturing](#)

ADVANCED MATERIALS

[Trapping light with nanowire-decorated micro-pyramids](#)

Nanotechweb, 18NOV2014

Researchers in the UK report a novel hybrid micro-nano surface that reduces reflectivity below 1% within a wide wavelength range (0.3–1 μm). They use a combination of dense periodic pyramids and nanowires to form a hybrid structure. This both increases light absorption and

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the p-n junction area, therefore decreasing reflectivity.

TECHNICAL ARTICLE

Tags: Advanced materials, S&T UK

Researchers synthesize new form of silicon for solar applications

[Nanowerk, 17NOV2014](#)

Researchers at Carnegie Mellon University were able to synthesize a new form of silicon with a quasi-direct band gap that falls within the desired range for solar absorption. The new silicon allotrope consists of an interesting open framework, called a zeolite-type structure, which is comprised of channels with five-, six- and eight-membered silicon rings. TECHNICAL ARTICLE

Tags: Advanced materials

Chemists develop porous molecules that bind greenhouse gases

[Science Daily, 13NOV2014](#)

Researchers at the University of Houston have developed a molecule based on an extensively fluorinated backbone which forms a structure with extremely small pores about 1.6 nanometers in diameter. These tiny pores are lined with fluorine atoms, giving them a high affinity for other molecules containing fluorine—such as fluoro-carbons and Freons. The molecule self-assembles into a structure that can capture these greenhouse vapors to the tune of 75 percent by weight. TECHNICAL ARTICLE

Tags: Advanced materials

'Forests' of carbon nanotubes grown on 3-D substrates

[Science Daily, 11NOV2014](#)

Researchers at the University of Maryland developed self-standing, catalyst-decorated carbon nanotube cathodes for Li-O₂ batteries using atomic layer deposition and electrochemical deposition methods. The technique significantly improves the performance of one of the most promising next-generation lithium battery technologies.

Tags: Advanced materials, CNT

Bending but not breaking: In search of new materials

[Science Daily, 10NOV2014](#)

Researchers at Drexel University have chemically engineered a new, electrically conductive nanomaterial that is flexible enough to fold, but strong enough to support many times its own weight. They believe it can be used to improve electrical energy storage, water filtration and radio frequency shielding in technology from portable electronics to coaxial cables. TECHNICAL ARTICLE

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Comet Landing, DJI Inspire Drone, and Giant Fighting Robots

[IEEE Spectrum, 14NOV2014](#)

Robots are not good at falling in a way that doesn't cause tremendous amounts of damage when they land. Georgia Tech researchers are taking inspiration from cats to try and teach robots how to orient themselves while falling to keep damage to a minimum.

Tags: Autonomous systems & robotics

BIOTECHNOLOGY

Cellular 'computers' gain a hard drive

[Nature News, 14NOV2014](#)

A new DNA-based recorder developed by researchers at MIT allows bioengineers to create cell cultures that detect information in their environment and store it for later use. Such 'designer' cells might in the future be used to monitor water quality, or measure the amount of sugar a person eats.

Tags: Biotechnology, Synthetic biology

COMMUNICATIONS TECHNOLOGY

Communications Technology Assessment for the Unmanned Aircraft System (UAS) Control and Non-Payload Communications (CNPC) Link

[NASA STI, 14NOV2014](#)

Researchers at NASA will evaluate the performance of several potential technologies for the CNPC link through detailed software simulations. In parallel, an industry partner will implement a technology in hardware to be used for flight testing. TECHNICAL ARTICLE

Tags: Communications technology

Optical 'watermills' control spinning light

[PhysOrg.com, 14NOV2014](#)

Researchers in the UK have built on research they conducted last year to achieve previously unseen levels of control over the travelling direction of electromagnetic wave in waveguides and proved that the process works equally well in reverse, opening up the way for the development of technologies that could revolutionise secure communications as well as high speed computing.

Tags: Communications technology, S&T UK

CYBER SECURITY

Self-repairing software tackles malware

[Science Daily, 13NOV2014](#)

Researchers at the University of Utah have developed software that not only detects and eradicates never-before-seen viruses and other malware, but also automatically repairs damage caused by them. The software then prevents the invader from ever infecting the computer again.

Tags: Cyber security

continued...

“For me, it is far better to grasp the Universe as it really is than to persist in delusion, however satisfying and reassuring”

CARL SAGAN

ENERGY

Electrochemical cell converts waste heat into electricity

PhysOrg.com, 18NOV2014

Researchers at MIT have created a cell with Prussian blue nanoparticles and ferrocyanide which needs only low-grade waste heat—less than 100C—to charge batteries. At lower temperatures the cell discharged more energy than was used to charge it, so converted heat to electricity. [TECHNICAL ARTICLE](#)

Tags: Energy, Battery

Light-harvesting: Mimicking photosynthesis with man-made leaves

Nanowerk, 14NOV2014

Researchers in Japan created a device with 440 ‘leaves’ using tubes made from periodic mesoporous organosilica and light-absorbing biphenyl. The PMO-Bp complexes were linked to five connected rhenium metal sticks, which transferred the light energy harvested by PMO-Bp directly to a central ruthenium sphere. The photons from the light source were concentrated very efficiently, first through the rhenium sticks and then into the ruthenium reaction center, with little loss of energy en-route.

[TECHNICAL ARTICLE](#)

Tags: Energy, Biotechnology, S&T Japan

ENVIRONMENTAL SCIENCE

Lightning expected to increase by 50 percent with global warming

Science Daily, 13NOV2014

According to researchers at UC Berkeley the main cause for the increase in lightning is water vapor, which fuels explosive deep convection in the atmosphere. The more convection, the greater the charge separation and the more cloud-to-ground strikes. The significant impact of increased lightning strikes would be more wildfires. More lightning would also likely generate more nitrogen oxides in the atmosphere, which exert a strong control on atmospheric chemistry. [TECHNICAL ARTICLE](#)

Tags: Environmental science, Climatology

IMAGING TECHNOLOGY

Novel nanoparticles that can simultaneously perform magnetic resonance imaging (MRI) and fluorescent imaging

Nanowerk, 18NOV2014

Researchers at MIT have developed new nanoparticles that can simultaneously perform MRI and fluorescent imaging in living animals. Such particles could help scientists track specific molecules produced in the body, monitor a tumor’s environment, or determine whether drugs have successfully reached their targets.

Tags: Imaging technology

INFORMATION TECHNOLOGY

Researchers create first image-recognition software that greatly improves web searches

PhysOrg.com, 18NOV2014

The system, developed by researchers at Dartmouth College, uses pixel data in images, and potentially video, to locate documents. It learns to recognize the pixels associated with a search phrase by studying the results from text-based image search engines. The knowledge gleaned from those results can then be applied to other photos without tags or captions.

Tags: Information technology, Big data

Researchers create and control spin waves, lifting prospects for enhanced information processing

Science Daily, 17NOV2014

An international team of researchers (USA, Spain) has developed a method to control the movements occurring within magnetic materials, which are used to store and carry information. The breakthrough could simultaneously bolster information processing while reducing the energy necessary to do so. [TECHNICAL ARTICLE](#)

Tags: Information technology

MATERIALS SCIENCE

Electrons move in different circles

Nanowerk, 14NOV2014

In some unusual material systems, such as graphene and topological insulators, electrons can sometimes behave as if they have no mass. These massless Dirac electrons differ from standard electrons in that they are mathematically described by a wavefunction with two components,

rather than the usual single component. Researchers in Japan have developed a technique for imaging the unusual properties of electrons. [TECHNICAL ARTICLE](#)

Tags: Materials science, Advanced materials

[New way to move atomically thin semiconductors for use in flexible devices](#)

Science Daily, 13NOV2014

Researchers from North Carolina State University have developed a new way to transfer thin semiconductor films, which are only one atom thick, onto arbitrary substrates, paving the way for flexible computing or photonic devices. The technique is much faster than existing methods and can perfectly transfer the atomic scale thin films from one substrate to others, without causing any cracks. [TECHNICAL ARTICLE](#)

Tags: Materials science, Flexible electronics

FEATURED RESOURCE

[RIKEN \(Japan\)](#)

RIKEN is one of Japan's largest research organizations with institutes and centers in locations throughout Japan. The site highlights articles published by RIKEN researchers across a broad spectrum of disciplines in science and technology. [RSS](#)

[‘Topological insulators’ promising for spintronics, quantum computers](#)

Science Daily, 13NOV2014

Researchers at Purdue University have reported the clearest demonstration of seemingly paradoxical conducting properties of topological materials and observed the “half integer quantum Hall effect” on the surface of a topological insulator. The discovery could make possible “spintronic” devices and practical quantum computers far more powerful than today’s technologies. [TECHNICAL ARTICLE](#)

Tags: Materials science, Quantum science

MICROELECTRONICS

[New technique to help produce next generation photonic chips](#)

Nanowerk, 17NOV2014

Researchers in the UK have developed a technique called Ultrafast photomodulation spectroscopy (UPMS) to find out the position of light in the chip at any given time. It uses ultraviolet laser pulses of femtosecond duration to change the refractive index of silicon in a tiny area on the photonic chip. The UPMS technique is fast and robust and has the

potential to be used for industrial testing in the photonics industry. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, S&T UK

[Scientists light the way for future electronic devices](#)

PhysOrg.com, 17NOV2014

By doping a chalcogenide glass and forming a multilayer structure with electrical contacts, researchers in the UK were able to show the same switching behaviour seen in a silicon transistor, but in a device made entirely from glass. The discovery has the potential to further shrink the size of phones, tablets and computers and reducing their energy consumption by turning waste heat into power.

[TECHNICAL ARTICLE](#)

Tags: Microelectronics, S&T UK

PHOTONICS

[Penn engineers efficiently ‘mix’ light at the nanoscale](#)

EurekAlert, 17NOV2014

Researchers at the University of Pennsylvania have engineered a nanowire system to combine two light waves to produce a third with a different frequency and use an optical cavity to amplify the intensity of the output to a usable level. Information in a photonic computer system could be encoded in a wave’s frequency. Being able to manipulate that quality in one wave with another allows for the fundamentals of computer logic. [TECHNICAL ARTICLE](#)

Tags: Photonics

[Spiral laser beam creates quantum whirlpool](#)

Science Daily, 17NOV2014

Researchers in Australia created the spiral beam by putting their laser through a piece of brass with a spiral pattern of holes in it. By using a spiral mask to structure the laser they created a chiral system that prefers one flow direction. Therefore they can create a single, stable vortex at will. The discovery could aid the development of completely novel technology to link conventional electronics with new laser and fibre-based technologies. [TECHNICAL ARTICLE](#)

Tags: Photonics, S&T Australia

[Using Plasma to Manipulate Light](#)

American Physical Society Spotlight, 14NOV2014

Researchers at Lawrence Livermore National Laboratory show theoretically that a beam’s polarization can be changed by combining it with another beam inside a plasma. A powerful laser would damage ordinary optical equipment by ripping electrons out of the atoms, but plasma is “already broken” in this way and isn’t further damaged by intense beams, like those used in the quest for fusion energy. [TECHNICAL ARTICLE](#)

Tags: Photonics, Government S&T

QUANTUM SCIENCE

[Simon's algorithm run on quantum computer for the first time—faster than on standard computer](#)

PhysOrg.com, 17NOV2014

An international team of researchers (South Africa, UK) describes how they ran the algorithm, the results they found and what doing so means for the future of quantum computing. Showing that one such algorithm can return a result more quickly on a quantum computer offers researchers hope that other algorithms, such as Shor's algorithm could be run much faster as well.

TECHNICAL ARTICLE

Tags: Quantum science

[A piece of the quantum puzzle](#)

Science Daily, 12NOV2014

Researchers at UC Santa Barbara have demonstrated a quantum version of Gauss's law. They measured the amount of deflection along one meridian of a sphere's curve and deduced the local curvature from that.

TECHNICAL ARTICLE

Tags: Quantum science

['Quantum reporters' measure magnetic resonance of one proton](#)

Physics World, 10NOV2014

Based on nuclear magnetic resonance, researchers at Harvard University have developed a quantum technique to pin down individual protons on a surface to within 0.1 nm. The method, which works at room temperature, uses an effect that is usually considered a nuisance because it degrades the performance of diamond-based qubits. The researchers say that the technique could be used to study individual proteins or even spins in a superconductor. TECHNICAL ARTICLE

Tags: Quantum science

S&T POLICY

[Airshow China 2014 Photo Report—Strike Weapons](#)

Defense Update, 14NOV2014

King Dragon provides a highly accurate rocket attack using INS/GPS and laser homing guidance. SM5 can carry 12 such rockets. The Fire Dragon 40(BRE) can be employed with NORINCO Type 81, 90B, SR4 and SR5 MLRS, as well as the standard BM-21 (Grad). The guidance method was not mentioned but is assumed to be INS/GPS.

Tags: S&T policy, Military technology, S&T China

[China predicted to outspend the US on science by 2020](#)

Nature, 12NOV2014

China is on track to overtake the United States in research and development (R&D) spending by the end of the decade, according to the biennial report, OECD Science, Technology and Industry Outlook 2014. Other developing and middle-income countries are also narrowing their gap with the United States, Europe and Japan. Related report Battelle Memorial Institute 2014 Global R&D Funding Forecast.

Tags: S&T policy

SENSORS

[Wearable antennas for remote monitoring](#)

PhysOrg.com, 14NOV2014

Researchers in Australia have developed a t-shirt made of conductive metallised fabric which is low-cost, flexible and lightweight. They are using snap-on buttons which form a connection between the textile antenna and the sensor device. It doesn't deteriorate easily and is washable.

Tags: Sensors, Flexible electronics

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