



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

[Advanced manufacturing \(3\)](#)

[Advanced materials \(6\)](#)

[Autonomous systems
& robotics \(4\)](#)

[Biotechnology \(1\)](#)

[Communications technology \(2\)](#)

[Cyber security \(2\)](#)

[Energy \(1\)](#)

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

[Information technology \(2\)](#)

[Materials science \(3\)](#)

[Microelectronics \(1\)](#)

[Photonics \(5\)](#)

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

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

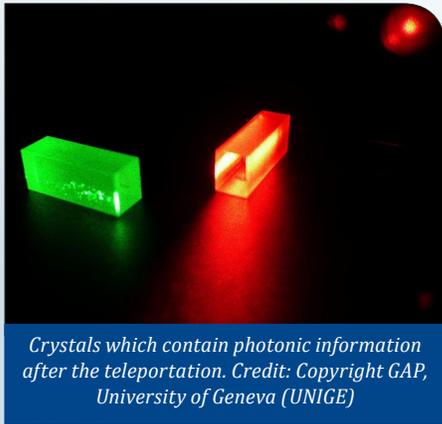
[Science without borders \(1\)](#)

[Sensors \(2\)](#)

FEATURE ARTICLES

[Physicists teleport quantum state of photon to crystal over 25 kilometers](#)

[Science Daily, 21SEP2014](#)



Crystals which contain photonic information after the teleportation. Credit: Copyright GAP, University of Geneva (UNIGE)

Researchers in Switzerland have succeeded in teleporting the quantum state of a photon to a crystal over 25 kilometres of optical fibre. Passing from light into matter, using teleportation of a photon to a crystal,

shows that, in quantum physics, it is not the composition of a particle which is important, but rather its state, since this can exist and persist outside such extreme differences as those which distinguish light from matter. **TECHNICAL ARTICLE**

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

[Computers 1,000 times faster? Quick-change materials break silicon speed limit for computers](#)

[Science Daily, 19SEP2014](#)

To overcome the limitations of size and speed, researchers from UK and Singapore designed processors using a type of phase changing material based on a chalcogenide glass which can be melted and recrystallized in as little as half a nanosecond using appropriate voltage pulses. Their goal is to replace both DRAM and logic processors in computers by new PCM-based non-volatile devices. **TECHNICAL ARTICLE**

Tags: Information Technology, Featured Article

ADVANCED MANUFACTURING

[Northeastern unveils state-of-the-art 3D nanoscale printing system](#)

[Nanowerk, 20SEP2014](#)

The system, developed by researchers at Northeastern University, blends traditional offset-type printing technologies with state-of-the-art technologies at the nanoscale to make products that leverage nanomaterials' superior properties. In only a matter of minutes, the system can print metals, organic and inorganic materials, polymers, and nanoscale structures and circuits onto flexible and inflexible substrates.

Tags: Advanced manufacturing

[A nanosized hydrogen generator](#)

[Science Daily, 19SEP2014](#)

Researchers at DOE's Argonne National Laboratory have created a small scale "hydrogen generator" that uses light and a two-dimensional graphene platform to boost production of hydrogen. They discovered that 2D graphene not only gives and receives electrons, but can also transfer them into another substance. **TECHNICAL ARTICLE**

Tags: Advanced manufacturing, Government S&T

[A Military-Grade Drone That Can Be Printed Anywhere](#)

[Wired, 16SEP2014](#)

A research team at the University of Virginia has created a 3D printed UAV drone no bigger than a remote-controlled plane that can carry a 1.5-pound payload. If it crashes or needs a design tweak for a new mission, another one can be printed out in a little more than a day, for just \$2,500. It's made with off-the-shelf parts and has an Android phone for a brain.

Tags: Advanced manufacturing

S&T NEWS ARTICLES

ADVANCED MATERIALS

Research demonstrates various possibilities for controlling light in the terahertz frequency range[PhysOrg.com](#), 23SEP2014

An international team of researchers (Spain, UK, USA) propose various compact devices comprising rectangular metal tubes with extremely narrow openings designed in such a way that they are capable of redirecting the electromagnetic waves with levels of efficiency close to 100%. The gaps are capable of imitating an ENZ (Epsilon Near Zero, which means permittivity close to zero) metamaterial so that it is not necessary to “fill them” with anything in order to obtain amazing results. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Terahertz technology***Ionic crystals go 1D**[Nanotechweb](#), 18SEP2014

Researchers in Japan have succeeded in making the first ionic atomic chain in which two chemical elements line up alternately. They chose double-walled CNTs with inner diameters of less than 1 nm to house 1D crystals of caesium and iodine. According to their theoretical calculations 1D ionic crystals have distinctly different optical properties from those of their bulk counterparts. The properties can be easily engineered by introducing atomic defects into the chains. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, S&T Japan***How to hide like an octopus**[MIT News](#), 17SEP2014

The new synthetic material developed by MIT and their collaborators is a form of elastomer. The texturing and deformation of the elastomer further activates special mechanically responsive molecules embedded in the elastomer, which causes it to fluoresce or change color in response to voltage changes. Once you release the voltage, both the elastomer and the molecules return to their relaxed state—like the cephalopod skin with muscles relaxed. [VIDEO](#)

*Tags: Advanced materials, Materials science***Oxides could advance memory devices**[Science Daily](#), 17SEP2014

Researchers at the City University of New York prepared a mineral using an innovative inorganic synthesis technique based on common elements: barium, titanium and manganese. They observed both magnetic and ferroelectric behavior in the mineral. What they uncovered was a new Hollandite crystal group designated “multiferroic.” [TECHNICAL ARTICLE](#)

*Tags: Advanced materials***Twisted graphene chills out**[Nanowerk](#), 17SEP2014

An international team of researchers (UK, Brazil, Switzerland) has shown how laser light interacts with a special kind of graphene to cool it down, instead of heating it up. This would make it possible to make electronic devices of graphene run cooler and faster simply by shining a laser on it. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials***Researchers control surface tension to manipulate liquid metals (w/video)**[Nanowerk](#), 15SEP2014

The technique developed by researchers at North Carolina State University hinges on the fact that the oxide “skin” of the metal—which can be deposited or removed—acts as a surfactant, lowering the surface tension between the metal and the surrounding fluid. It opens the door to a new generation of reconfigurable electronic circuits, antennas and other technologies. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

AUTONOMOUS SYSTEMS & ROBOTICS

Robots That Learn Through Repetition, Not Programming[MIT Technology Review](#), 22SEP2014

A company in California has developed an operating system for robots called BrainOS which makes training the robot like training a dog. The software is based on a combination of several different artificial intelligence techniques and artificial neural networks, which are inspired by the way brain cells communicate.

*Tags: Autonomous systems & robotics***Build your own bot**[Harvard Gazette](#), 19SEP2014

The [Soft Robotics Toolkit](#), released by Harvard University and their collaborators, is an online treasure trove of downloadable, open-source plans, how-to videos, and case studies to help users design, fabricate, model, characterize, and control soft robotic devices. It will provide researchers with a level of detail not typically found in academic research papers including 3-D models, bills of materials, raw experimental data, multimedia step-by-step tutorials, and case studies of various soft robot designs.

*Tags: Autonomous systems & robotics***Video Friday IROS 2014: Humanoid Eyes, Drones With Arms, and Printable Robots**[IEEE Spectrum](#), 19SEP2014

To facilitate everyday users developing custom robots for personal use, MIT Researchers present a new system to easily create printable foldable robots from high-level structural specifications.

*Tags: Autonomous systems & robotics**continued...*

“All our science, measured against reality, is primitive and childlike and yet it is the most precious thing we have.” ALBERT EINSTEIN

Tiny Humanoid Robot Learning to Fly Real Airplanes (w/video)

IEEE Spectrum, 18SEP2014

PIBOT, a humanoid robot developed by researchers in South Korea, is able to identify and use all of the buttons and switches and stuff that you'd find in the cockpit of a normal light aircraft designed for humans. According to the researchers, PIBOT can satisfy the various requirements specified in the flying handbook by the Federal Aviation Administration.

Tags: *Autonomous systems & robotics*

BIOTECHNOLOGY

Recruiting bacteria as technology innovation partners: New self-healing materials and bioprocessing technologies

Science Daily, 17SEP2014

Researchers at Harvard University developed a novel protein engineering system called BIND (Biofilm-Integrated Nanofiber Display). They altered the composition of the extracellular material itself—essentially turning it into a self-replicating production platform to churn out whatever material they wish to produce.

Tags: *Biotechnology*

COMMUNICATIONS TECHNOLOGY

Google plans to have a ring of high altitude internet balloons in southern hemisphere providing wireless internet service by the end of 2015

Next Big Future, 23SEP2014

The goal is to demonstrate a practical way to get wireless Internet access to billions of people who don't have it today. Loon balloons, as they are known, fly at 60,000 feet and can stay aloft for as long as 100 days, their electronics powered by solar panels. They provide wireless Internet using the same LTE protocol used by cellular devices.

Tags: *Communications Technology*

'Plasma bubbles' may have aided enemy in fatal Afghan battle

Science Daily, 23SEP2014

Researchers at Johns Hopkins University provide evidence that plasma bubbles may have contributed to the communications outages during the battle of Takur Ghar and present a new computer model that could help predict the impact of such bubbles on future military operations. They form after dark in the upper atmosphere. Typically around 100

kilometers (62 miles) wide, the bubbles can't be seen but they can bend and disperse radio waves, interfering with communications. [TECHNICAL ARTICLE](#)

Tags: *Communications Technology*

CYBER SECURITY

New bracelet strengthens computer security

Science Daily, 22SEP2014

Researchers at Dartmouth College have created a new approach to computer security that authenticates users continuously while they are using a terminal and automatically logs them out when they leave or when someone else steps in to use their terminal.

Tags: *Cyber security*

Modeling of self-healing against cascading overload failures in complex networks

IOP Science, 15SEP2014

Researchers in China introduce a model for self-healing against overload propagation in complex networks due to malicious attack. They show how networks in cascading failures can be saved from the brink of collapse by proper combination of both restoration timing and resource.

Tags: *Cyber security, S&T China*

ENERGY

New formulation leads to improved liquid battery

MIT News, 21SEP2014

The new battery designed by researchers at MIT uses two layers of molten metal lithium, a mixture of lead and antimony, separated by a layer of molten salt that acts as the battery's electrolyte. Because each of the three materials has a different density, they naturally separate into layers, like oil floating on water. The battery can operate at temperatures of 450 to 500 C.

Tags: *Energy, Battery*

ENVIRONMENTAL SCIENCE

Solar explosions 'inside' a computer: Understanding solar flares to improve predictions

Science Daily, 23SEP2014

Researchers in Switzerland have examined the processes that take place when explosions occur on the Sun's surface. They were able to accurately reconstruct the statistical size distribution and temporal succession of the solar flares with a computer model. They found that turbulence and

interaction between the magnetic flux tubes are essential components which control the occurrence of solar flares.

TECHNICAL ARTICLE

Tags: *Environmental science, S&T Switzerland*

INFORMATION TECHNOLOGY

Artificial intelligence that imitates children's learning

Alphagalileo, 23SEP2014

Researchers in Sweden have created computer programmes with a generalised type of intelligence, enabling them to solve problems in vastly different areas. The programme is designed to imitate certain aspects of children's cognitive development. The programme can learn for example basic arithmetic, logic and grammar without any pre-existing knowledge.

Tags: *Information Technology, Artificial intelligence*

FEATURED RESOURCE

Nanowerk

Nanowerk is committed to educate, inform and inspire about nanosciences, nanotechnologies and other emerging technologies. [RSS](#)

MATERIALS SCIENCE

Researchers make temporary, fundamental change to a material's properties

PhysOrg.com, 23SEP2014

An international team of researchers (Switzerland, USA, Japan) conducted an experiment on the material $\text{Pr}_{0.5}\text{Ca}_{0.5}\text{MnO}_3$, where additional energy was injected into electrons with the help of a very short laser pulse. The material transformed, to a certain extent, from an insulator into a metal. It manifested colossal magnetoresistance which could be of importance for electronic devices.

TECHNICAL ARTICLE

Tags: *Materials science*

Graphene accelerates the electro-optic response in ferroelectric liquid crystal displays

Nanowerk, 18SEP2014

Researchers at the US Naval Academy have developed a technique to amplify *spontaneous polarization* by doping graphene into Ferroelectric liquid crystals. The graphene-induced enhanced *spontaneous polarization* allows the FLC to switch even faster. The findings will open up new research areas, such as their potential applications in LC based electro-optic devices. [TECHNICAL ARTICLE](#)

Tags: *Materials science, Government S&T*

New study helps uncover mechanism behind solid-solid phase transitions

Nanowerk, 16SEP2014

An international team of researchers (USA, Hong Kong, China) found that some crystals have an easier time of making the solid-solid transition if they take it in two steps. The first step of the process involves the parent phase producing droplets of liquid. The liquid droplets then evolve into the daughter phase. The observations have potential implications for developing alloys and understanding natural processes that occur deep within Earth's mantle. [TECHNICAL ARTICLE](#)

Tags: *Materials science*

MICROELECTRONICS

Toward optical chips: Promising light source for optoelectronic chips can be tuned to different frequencies

Science Daily, 19SEP2014

Researchers at MIT have developed a new technique for building MoS_2 light emitters tuned to different frequencies, an essential requirement for optoelectronic chips. Since thin films of material can also be patterned onto sheets of plastic the same work could point toward thin, flexible, bright, color displays. [TECHNICAL ARTICLE](#)

Tags: *Microelectronics*

PHOTONICS

Engineers show light can play seesaw at the nanoscale: Step toward faster and more energy-efficient optical devices

Science Daily, 22SEP2014

For the first time, researchers at the University of Minnesota have developed a unique nanoscale device that demonstrates mechanical transportation of light. The discovery could have major implications for creating faster and more efficient optical devices for computation and communication. [TECHNICAL ARTICLE](#)

Tags: *Photonics, Communications Technology*

Magnetic fields make the excitons go 'round

MIT News, 21SEP2014

As the excitons hop through the material, they are prone to getting stuck in minuscule defects, or traps—causing them to release their energy as wasted light. A team of researchers at MIT and Harvard University has found a way of rendering excitons immune to these traps, possibly improving photovoltaic devices' efficiency.

Tags: *Photonics*

Uncovering the forbidden side of molecules: Infrared spectrum of charged molecule seen for first time

Science Daily, 21SEP2014

An international team of researchers (Switzerland, China) succeeded in observing the extremely weak infrared spectrum of a charged molecule. It creates the possibility for extremely precise measurements of molecular properties and contributes to the development of molecular clocks and quantum technology. **TECHNICAL ARTICLE**

Tags: Photonics

New plasmonic nanolaser is cavity-free

Nanotechweb, 19SEP2014

The laser, proposed by researchers in the UK, makes use of two zero-velocity regions, and would achieve population inversion and create a laser beam without the need for an optical cavity. The researchers suggest that the design could have important applications in optical telecommunications, computing, and theoretical implications in reconciling the physics of lasers with plasmonics.

Tags: Photonics, S&T UK

Superabsorbing ring could make light work of snaps, be ultimate camera pixel

Science Daily, 19SEP2014

Researchers in the UK designed a molecular ring which is charged to 50% by a laser pulse in order to reach the ideal superabsorbing state. Each time it absorbs a photon, the ring becomes receptive to photons of a slightly higher energy. The final ingredient of the design is a molecular 'wire' that draws off the energy of newly absorbed photons. The discovery could lead to harvesting sunlight in a highly-efficient way. A more immediate application would be building an extremely sensitive light sensor that could form the basis of new camera technology.

TECHNICAL ARTICLE

Tags: Photonics, Imaging Technology, S&T UK

S&T POLICY

Chinese science gets mass transformation

Nature News, 23SEP2014

The Chinese Academy of Sciences is making unprecedented structural reforms to foster collaboration and turbocharge research. Reforms include boosting scientists' salaries, establishing centers of excellence, more collaboration, and commercialization of findings.

Tags: S&T policy, S&T China

SCIENCE WITHOUT BORDERS

An anomaly in satellites' flybys confounds scientists

Science Daily, 19SEP2014

When space probes fly over certain planets and moons

their speed changes slightly for an unknown reason. Scientists have still not found any convincing explanation for the phenomenon, although they have put forward a range of hypotheses. According to researchers in Spain, hypothetical gravitomagnetic field could have an influence. The difference in speeds could also have much more serious implications on the understanding of gravity.

TECHNICAL ARTICLE

Tags: Science without borders, Space technology

SENSORS

Graphene imperfections key to creating hypersensitive 'electronic nose'

EurekAlert, 22SEP2014

Researchers at the University of Illinois at Chicago created a micron-sized individual graphene grain boundary. They found that gas molecules are attracted to the grain boundary and accumulate there rather than on the graphene crystal, making it the ideal spot for sensing gas molecules. They increased sensitivity to absorbed gas molecules by 300 times.

Tags: Sensors, Advanced materials

Seeing Through the Fog (and Dust and Snow) of War

DARPA News, 18SEP2014

DARPA's Multifunction RF (MFRF) program seeks to overcome degraded visibility challenges and enhance the survivability and combat effectiveness of helicopters facing degraded visibility. The program aims to develop multifunction sensor technology that would enable sensor packages small, light and efficient enough for installation on existing and future helicopter designs. MFRF completed successful flight demonstrations.

Tags: Sensors, DARPA, Government S&T ■

ABOUT THIS PUBLICATION

The appearance of external hyperlinks in this publication does not constitute endorsement by the United States Department of Defense (DoD) of the linked web sites, nor the information, products or services contained therein. In addition, the content featured does not necessarily reflect DoD's views or priorities.

To **SUBSCRIBE** or **UNSUBSCRIBE**, visit <https://tin-ly.sainc.com/ASDRE>. To provide feedback or ask questions, contact us at asdre-st-bulletin-reply@sainc.com. This publication is authored and distributed by:

Office of Technical Intelligence (OTI)

Ms. Hema Viswanath, OTI Corporate Librarian