

[Advanced manufacturing \(1\)](#)[Advanced materials \(7\)](#)[Autonomous systems & robotics \(1\)](#)[Big data \(1\)](#)[Biotechnology \(2\)](#)[Communications technology \(3\)](#)[Energy \(3\)](#)[Environmental science \(3\)](#)[Information technology \(2\)](#)[Microelectronics \(2\)](#)[Neuroscience \(4\)](#)[Quantum science \(5\)](#)[Science without borders \(1\)](#)

## FEATURE ARTICLES

### [Ventriloquist delight: Scientists twist sound with metamaterials so sound appears to come from somewhere else](#)

[Science Daily](#), 25FEB2014

An international team of researchers (USA, China) reports a simple design for a device, called an acoustic field rotator, which can twist wave fronts inside it so that they appear to be propagating from another direction. The team hopes their acoustic rotator, with its ability to freely manipulate acoustic wavefronts, will improve the operation of devices like medical ultrasound machines, which require the precise control of acoustic waves. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Featured Article*

### [Closing the 'free will' loophole: Using distant quasars to test Bell's theorem](#)

[MIT News](#), 20FEB2014

The idea proposed by researchers at MIT is that if two quasars on opposite sides of the sky are sufficiently distant from each other, they would have been out of causal contact since the Big Bang some 14 billion years ago. They would have had no possible means of any third party communicating with both of them since the beginning of the universe—an ideal scenario



Artist's interpretation of ULAS J1120+0641, a very distant quasar.  
IMAGE: ESO/M. KORNMESSE

for determining each particle detector's settings.

[TECHNICAL ARTICLE](#)

*Tags: Quantum science, Featured Article*

## S&T NEWS ARTICLES

### ADVANCED MANUFACTURING

#### [3D printing takes on metal at Amsterdam lab \(w/ video\)](#)

[PhysOrg.com](#), 21FEB2014

Researchers in the Netherlands have developed a method that combines a robotic arm typically used in car manufacturing with a welding machine to melt and deposit metal to create lines that can be printed horizontally, vertically, or in curves, without the need for support structures. Adding small amounts of molten metal at a time, lines are printed in mid-air. The team's vision is an affordable, multi-axis MX3D tool for workshops around the world.

*Tags: Advanced manufacturing*

### ADVANCED MATERIALS

#### [How to create selective holes in graphene](#)

[Nanowerk](#), 25FEB2014

Researchers at MIT, Oak Ridge National Laboratory, and Saudi Arabia succeeded in creating subnanoscale pores in a sheet of the one-atom-thick material. The development could lead to ultrathin filters for improved desalination or water purification. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Materials science*

#### [Iron oxide as an ultralightweight](#)

[Nanowerk](#), 25FEB2014

An international team of researchers (Australia, China) has introduced a method for the synthesis of ultralight three-dimensional iron oxide frameworks with two different types of nanoscopic pores and tunable surface properties. This superparamagnetic material can be cut into arbitrary shapes and is suitable for applications such as multiphase catalysis and the removal of heavy metal ions and oil from water. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials*

*continued..*

[BACK TO TOP](#)

## [Nanotechnology may be key to solar energy and energy storage](#)

Nanowerk, 25FEB2014

In a Nanotechnology Roadmap researchers in Germany suggest that the following nanomaterial technologies will be of particular importance: “organic and printed electronics”, “nano-coatings”, “nano-composites”, “nano-fluids”, “nano-catalysts”, “nanocarbons” and “nano-electrodes”.

Tags: *Advanced materials, Emerging technology, S&T Germany*

## [Scientists demonstrate electrical properties of topological insulators](#)

PhysOrg.com, 25FEB2014

Researchers at the Naval Research Laboratory used a ferromagnetic metal/tunnel barrier contact as a voltage probe to detect the spin polarization created in the topologically protected surface states when an unpolarized bias current is applied. This provides direct access to the TI surface state spin system and significantly advances our fundamental understanding of this new quantum state. TECHNICAL

ARTICLE

Tags: *Advanced materials, Government S&T*

## [On the road to Mottronics: Key to controlling the electronic and magnetic properties of Mott thin films](#)

Science Daily, 24FEB2014

Mott materials hold great promise for future transistors and memories that feature higher energy efficiencies and faster switching speeds than today’s devices if their phase transitions can be controlled. Now a team of researchers at DOE’s Lawrence Berkeley National Laboratory have demonstrated that the conducting/insulating phases of ultra-thin films of Mott materials can be controlled by applying an epitaxial strain to the crystal lattice. TECHNICAL ARTICLE

Tags: *Advanced materials, Government S&T, Materials science*

## [New chemistry could make it easier to design materials to order](#)

Nanowerk, 20FEB2014

Researchers in the UK demonstrated how the chemical reactions used to produce polymers can be controlled by switching ‘on’ and ‘off’ the catalyst used to make the polymers. They found that by using this catalyst control method, it is possible to select the monomers that will be added to the chain and therefore control the pattern and composition of the final polymers. TECHNICAL ARTICLE

Tags: *Advanced materials, Materials science, S&T UK*

## AUTONOMOUS SYSTEMS & ROBOTICS

### [Video Friday: Google’s Project Tango, Visual Servoing, and Valkyrie at Work](#)

IEEE Spectrum, 21FEB2014

Robots are getting more and more affordable, and Pi-Bot is one of the absolute most affordable kits we’ve ever seen.

It’s Arduino-based, includes motors, sensors, LEDs, and more, and if you pledge for one on Kickstarter, it’s just \$75.

Tags: *Autonomous systems & robotics*

## BIG DATA

### [Researchers propose a better way to make sense of ‘Big Data’](#)

PhysOrg.com, 18FEB2014

Part of the lure of Big Data is that it may reveal entirely new, unexpected patterns. Researchers at Cold Harbor Spring demonstrate that the new statistical methods developed to uncover novel relationships are critically flawed. They propose that the solution is a mathematical measure called “mutual information,” first described in 1948. It was initially used to quantify the amount of information that could be transmitted electronically through a telephone cable. According to the researchers the same concept can also be used to find patterns in data.

TECHNICAL ARTICLE

Tags: *Big data*

## BIOTECHNOLOGY

### [Video of virus-sized particle trying to enter cell](#)

Princeton University News, 25FEB2014

Researchers at Princeton University have achieved an unprecedented look at a virus-like particle as it tries to break into and infect a cell. The technique they developed could help scientists learn more about how to deliver drugs via nanoparticles—which are about the same size as viruses—as well as how to prevent viral infection from occurring. VIDEO

Tags: *Biotechnology, Medical technology*

### [Essential step toward printing living human tissues](#)

Science Daily, 19FEB2014

To print 3D tissue constructs with a predefined pattern, researchers at Harvard University developed functional inks with useful biological properties—tissue-friendly inks containing key ingredients of living tissues. One ink contained extracellular matrix. A second ink contained both extracellular matrix and living cells. To create blood vessels, they developed a third ink with an unusual property: it melts as it cools, rather than as it warms.

TECHNICAL ARTICLE

Tags: *Biotechnology*

## COMMUNICATIONS TECHNOLOGY

### [Project “Outernet” looking to bring free Internet to entire world](#)

PhysOrg.com, 24FEB2014

A team of workers at Media Development Investment Fund (MDIF), a New York based company, is proposing that hundreds of cube satellites be built and launched to

*continued...*

“No sensible decision can be made any longer without taking into account not only the world as it is, but the world as it will be..” ISSAC ASIMOV

create a constellation of sorts in the sky, allowing anyone with a phone or computer to access Internet data sent to the satellites by several hundred ground stations. “Outernet”

*Tags: Communications Technology*

### **New study reveals communications potential of graphene**

Nanowerk, 19FEB2014

Until now graphene’s ability to absorb electromagnetic radiation was not known. Researchers in the UK have demonstrated that the transparent material increased the absorption of electromagnetic energy by 90 per cent at a wide bandwidth. [TECHNICAL ARTICLE](#)

*Tags: Communications Technology, S&T UK*

### **Switching with single photons**

Nanowerk, 19FEB2014

Researchers in Germany have succeeded in switching a medium—a cloud of about 200 000 ultracold atoms—from being transparent to being opaque for light pulses. This “single-photon-switch” could be the first step in the development of a quantum logic gate, an essential component in the field of quantum information processing.

[TECHNICAL ARTICLE](#)

*Tags: Communications Technology, S&T Germany*

## ENERGY

### **New, inexpensive production materials boost promise of hydrogen fuel**

Science Daily, 21FEB2014

Researchers at the University of Wisconsin-Madison have combined cheap, oxide-based materials to split water into hydrogen and oxygen gases using solar energy with a solar-to-hydrogen conversion efficiency of 1.7 percent, the highest reported for any oxide-based photoelectrode system. [TECHNICAL ARTICLE](#)

*Tags: Energy, Materials science*

### **Artificial leaf jumps developmental hurdle**

Science Daily, 18FEB2014

Researchers at Arizona State University and Argonne National Laboratory report advances toward perfecting a functional artificial leaf. They show that an artificial reaction centre that features a benzimidazole-phenol model of the Tyr-His pair mimics both the short-internal hydrogen bond in photosystem II and, using electron paramagnetic resonance spectroscopy, the thermal relaxation that accompanies proton-coupled electron transfer. [TECHNICAL ARTICLE](#)

*Tags: Energy, Government S&T*

### **Scientists successfully simulate ‘neutronics’—the behavior of neutrons in a reactor core**

Science Daily, 18FEB2014

Researchers at the DOE’s Oak Ridge National Laboratory have successfully tested a new suite of computer codes that closely model “neutronics”—the behavior of neutrons in a reactor core. This new modeling capability will allow designers to obtain higher-fidelity power distribution predictions in a reactor core and ultimately further improve reactor performance.

*Tags: Energy, Government S&T*

## ENVIRONMENTAL SCIENCE

### **Offshore wind farms could tame hurricanes before they reach land, Stanford-led study says**

KurzweilAI, 26FEB2014

Researchers at Stanford University simulated three hurricanes: Sandy and Isaac, which struck New York and New Orleans, respectively, in 2012; and Katrina, which devastated New Orleans in 2005. They found that when wind turbines are present, they slow down the outer rotation winds of a hurricane. This feeds back to decrease wave height, which reduces movement of air toward the center of the hurricane, increasing the central pressure, which in turn slows the winds of the entire hurricane and dissipates it faster. [TECHNICAL ARTICLE](#)

*Tags: Environmental science, Climatology*

### **Climate engineering: Minor potential, major risk of side-effects?**

Science Daily, 25FEB2014

Researchers in Germany have studied with computer simulations the long-term global consequences of several ‘climate engineering’ methods. They show that all the proposed methods would either be unable to significantly reduce global warming if CO<sub>2</sub> emissions remain high, or they could not be stopped without causing dangerous climate disruption. [TECHNICAL ARTICLE](#)

*Tags: Environmental science, Climatology*

### **Climate change: Unstable Atlantic deep ocean circulation may hasten ‘tipping point’**

Science Daily, 20FEB2014

Deep waters formed in the northern North Atlantic fill approximately half of the deep ocean globally. This impacts the circum-Atlantic climate and regional sea level, and it soaks up much of the excess atmospheric carbon dioxide from industrialisation—helping moderate the effects of global warming. A study by researchers in Norway suggests

that changes in this circulation mode are considered a potential tipping point in future climate change.

#### TECHNICAL ARTICLE

*Tags: Environmental science, Climatology, S&T Germany*

## INFORMATION TECHNOLOGY

### Self-completing programs

[MIT News, 25FEB2014](#)

Researchers at MIT have been working on a programming language called Sketch, which allows programmers to simply omit some of the computational details of their code. Sketch then automatically fills in the gaps. If it's fleshed out and made more user-friendly, Sketch could ultimately make life easier for software developers. But in the meantime, it's proving its worth as the basis for other tools that exploit the mechanics of "program synthesis," or automatic program generation.

*Tags: Information Technology*

### Controlling magnetism with an electric field

[Science Daily, 18FEB2014](#)

Researchers at the University of Miami are proposing a novel approach to achieve greater memory density while producing less heat: by using an electric field instead of a current to turn magnetism on and off, thereby encoding the electrical devices. TECHNICAL ARTICLE

*Tags: Information Technology*

## FEATURED RESOURCE

### Nanotechweb.org

Nanotechweb.org is a unique global portal for the nanotechnology community provided by the IOP publishing. It provides news, an events calendar, product information, jobs and a free weekly news alert highlighting key research worldwide. RSS

## MICROELECTRONICS

### New approach to chip design could yield light speed computing

[Nanowerk, 25FEB2014](#)

An international team of researchers (USA, South Korea) discovered that light-induced electrical currents rise much more sharply at the intersection of carbon nanotubes and silicon, compared to the intersection of silicon and a metal, as in traditional photodiode devices. That sharp rise helps design devices that can be turned on and off using light.

#### TECHNICAL ARTICLE

*Tags: Microelectronics*

### Intel Touts New Ultra-High-Speed Wireless Data Technology

[MIT Technology Review, 24FEB2014](#)

Intel says it has prototyped a chip-based antenna array that can sit in a milk-carton-sized cellular base station. The technology could turbocharge future wireless networks by using ultrahigh frequencies.

*Tags: Microelectronics*

## NEUROSCIENCE

### Simulating biological thought process within a computer system

[Medical Express, 25FEB2014](#)

In a report the Australian Academy of Science proposes to study the brain by simulating the biological thought process within a new computer system. A bionic brain built on biological principles could suggest entirely new approaches to artificial intelligence, fail-safe smart machines, and neural circuits. The Report

*Tags: Neuroscience, Artificial intelligence, S&T Australia*

### New ideas change your brain cells: UBC research

[Medical Express, 24FEB2014](#)

Researchers in Canada show that learning stimulates our brain cells in a manner that causes a small fatty acid to attach to delta-catenin, a protein in the brain. This biochemical modification is essential in producing the changes in brain cell connectivity associated with learning.

*Tags: Neuroscience, S&T Canada*

### Brain signals move paralyzed limbs in new experiment

[Science Daily, 19FEB2014](#)

Researchers at Cornell University are bringing brain-machine interfaces to the next level: Instead of signals directing a device, they hope to help paralyzed people move their own limb, just by thinking about it.

#### TECHNICAL ARTICLE

*Tags: Neuroscience*

### Workings of working memory revealed

[Science Daily, 19FEB2014](#)

Cognitive scientists have identified specific brain regions that work together to allow us to choose from among the options we store in working memory. Now researchers at Brown University say they've learned how your brain plucks information out of working memory when you decide to act. TECHNICAL ARTICLE

*Tags: Neuroscience*

## QUANTUM SCIENCE

### [How do you build a large-scale quantum computer?](#)

Science Daily, 25FEB2014

Researchers at the University of Maryland have proposed a modular quantum computer architecture that promises scalability to much larger numbers of qubits. The components of this architecture have individually been tested and are available, making it a promising approach.

#### TECHNICAL ARTICLE

Tags: Quantum science, Communications Technology

### [Taking a peek at a qubit](#)

Nanotechweb, 24FEB2014

Physicists in the Netherlands have succeeded in manipulating the state of a quantum bit by simply adjusting the strength of the technique they used to measure it. The method, which involves using an ancilla qubit and a novel quantum “non-demolition” readout, can be used to “steer” the measured qubit’s state to a desired state. The work is not only of interest for fundamental physics, but could also be important for future quantum computers and for improving the sensitivity of magnetic field sensors. TECHNICAL ARTICLE

Tags: Quantum science

### [Quantum computation in diamond](#)

Nanowerk, 19FEB2014

An international team of researchers (Germany, Japan, Switzerland, China) has found a way to control the quantum system of a diamond with a small number of nitrogen impurities. They can thus specifically address quantum bits in the diamond and combine several bits to a computing register and use the new degree of control for a logic operation, which is essential for a quantum computer, and for error correction. TECHNICAL ARTICLE

Tags: Quantum science

### [Quantum researchers close in on dream vacancy](#)

University of Cambridge, 18FEB2014

An international team of researchers (UK, Germany, Switzerland, Austria) have successfully tested a new way of using miniscule fragments of diamond to transmit information, a method which could eventually lead to the development of new computing and sensing technologies.

#### TECHNICAL ARTICLE

Tags: Quantum science, Materials science, S&T UK

## SCIENCE WITHOUT BORDERS

### [Scientists complete the top quark puzzle](#)

Science Daily, 24FEB2014

Researchers at the DOE’s Fermi National Accelerator Laboratory observed one of the rarest methods of producing the elementary particle—creating a single top quark through the weak nuclear force, in what is called the “s-channel.” The discovery completes a portrait of one of the fundamental particles of our universe by showing us one of the rarest ways to create them.

Tags: Science without borders, Government S&T, Particle physics ■

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