



# S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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## FEATURE ARTICLES

### [Quantum ‘sealed envelope’ system enables “perfectly secure” information storage](#)

[University of Cambridge, 04NOV2013](#)



*Credit: Paul Hocksenaer*

An international team of researchers (Switzerland, Singapore, UK, Canada) sent encrypted data between pairs of sites in Geneva and Singapore, kept “perfectly secure” for fifteen milliseconds—putting into practice what cryptographers call a ‘bit commitment’ protocol, based on theoretical work by UK scientists. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, Breakthrough technology, S&T Canada, S&T Switzerland, S&T UK, Featured Article*

### [Seeing in the Dark: For Infrared Tracking and Recognition, Two Sensors Are Better Than One](#)

[Science Daily, 29OCT2013](#)

Researchers in China have developed a novel instrument that both recognizes and identifies an IR source with extremely high sensitivity by splitting the IR radiation given off by an object into a long-wave portion for detection and a mid-wave portion that can be spectrally analyzed for accurate identification. [TECHNICAL ARTICLE](#)

*Tags: Sensors, S&T China*

## S&T NEWS ARTICLES

### ADVANCED MANUFACTURING

#### [New Techniques Produce Cleanest Graphene Yet](#) [Science Daily, 31OCT2013](#)

Using a new contact architecture, researchers at Columbia University have developed a new assembly technique for layered materials that prevents contamination at the interfaces. Using graphene as the model 2D material, they show that these two methods in combination result in the cleanest graphene yet realized. [TECHNICAL ARTICLE](#)

*Tags: Advanced manufacturing, Advanced materials*

#### [The problem with 3D printing](#)

[Printed Electronics World, 30OCT2013](#)

In its new report “3D Printing Materials 2014-2025: Status, Opportunities, Market Forecasts,” IDTechEx forecasts a market value of \$615m in 2025. Our analysis shows that the market will not reach a fully competitive state by 2025, meaning that suppliers will continue to charge premiums on their materials.

*Tags: Advanced manufacturing*

### ADVANCED MATERIALS

#### [Novel microfluidic material breakthrough for wafer-scale mass production of lab-on-chip](#) [Nanowerk, 01NOV2013](#)

Researchers in Belgium have successfully used PA (Photopatternable Adhesive) material for wafer-scale processing of lab-on-chip devices. PA is a breakthrough material: a good microfluidic channel material and adhesive at the same time, suitable for wafer-scale processes and mass production.

*Tags: Advanced materials, Materials science*

#### [Defective nanotubes turned into light emitters](#) [Nanowerk, 31OCT2013](#)

Researchers in Spain have developed and patented a new source of light emitter based on boron nitride nanotubes suitable for developing high-efficiency optoelectronic devices. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials*

*continued...*

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## [Gold Nanoparticles Give an Edge in Recycling Carbon Dioxide](#)

Science Daily, 24OCT2013

Using finely tuned gold nanoparticles, researchers at Brown University have developed a catalyst that selectively converts carbon dioxide to carbon monoxide, an active carbon molecule that can be used to make alternative fuels and commodity chemicals. [TECHNICAL ARTICLE](#)

Tags: *Advanced materials, Materials science*

## AUTONOMOUS SYSTEMS & ROBOTICS

### [Video Friday: Unstoppable Drones, Rock-Paper-Scissors Robot, and Nao Is a Chatterbox](#)

IEEE Spectrum, 01NOV2013

There's nothing really new in this pile of B-Roll of Northrop Grumman's X-47B UCAS, but I'm still not over the fact that it totally looks like it belongs in a sci-fi movie.

Tags: *Autonomous systems & robotics*

### [Developing robots that collaborate with people](#)

KurzweilAI, 29OCT2013

NSF, in partnership with NIH, USDA and NASA, has announced about \$38 million in investment for developing robots that cooperatively work with people to enhance individual human capabilities, performance and safety.

Tags: *Autonomous systems & robotics, S&T Policy*

## BIG DATA

### [IBM Expands BigData Portfolio with New Predictive Intelligence Software](#)

IBM News, 04NOV2013

New software will enable clients to apply foundational elements of cognitive intelligence throughout their IT infrastructure. This will enable employees to gain insights from Big Data instead of focusing on how to cope with its sheer volume.

Tags: *Big data*

## BIOTECHNOLOGY

### [Watch 'Intelligent' Blobs Sort Themselves by Surface Tension](#)

MIT Technology Review, 23OCT2013

Researchers at Northwestern University use the blobs to make simple machines that produce circular motion, oscillations or one machine that sorts blobs by surface tension. That has implications for technologies such as microfluidics.

[TECHNICAL ARTICLE, VIDEO](#)

Tags: *Biotechnology, Microfluidics*

## COMMUNICATIONS TECHNOLOGY

### [Vibrating Micro Plates Bring Order to Overcrowded Radio Spectrum](#)

Science Daily, 30OCT2013

Researchers in the Netherlands present filters based on micromechanical resonators which can be accurately tuned to the desired frequency. The researchers also expect that these resonators can be integrated on the chip or directly 'bonded' to the chip as they are much smaller than inductors. It therefore becomes possible to apply fifty resonator pairs, which facilitates flexible use of frequencies. [TECHNICAL ARTICLE](#)

Tags: *Communications Technology*

## ENERGY

### [Looking for tomorrow's power source? Go fly a \(underwater\) kite](#)

EurekAlert, 05NOV2013

Worcester Polytechnic Institute receives NSF award to explore the use of tethered undersea kites to generate electricity from tides and currents. Just as wind turbines can convert moving air into electricity, there is the potential to transform these virtually untapped liquid 'breezes' into vast amounts of power. For example, it has been estimated that the potential power from the Florida Current, which flows from the Gulf of Mexico into the Atlantic Ocean, is 20 gigawatts—equivalent to about 10 nuclear power plants.

Tags: *Energy*

### [The Next Big Thing in the Energy Sector: Photovoltaic Generated DC Electricity](#)

Science Daily, 05NOV2013

A team of researchers from Clemson University and Penn State have proposed a new multi-terminal multi-junction architecture for inexpensive PV electricity generation. Efficiency will exceed the currently feasible 25%.

[TECHNICAL ARTICLE](#)

Tags: *Energy*

### [A flexible battery made with carbon nanotubes](#)

Nanowerk, 04NOV2013

The battery is made from carbon nanotubes and micro-particles that serve as active components. The battery has another revolutionary potential, in that it could be fabricated at home by consumers. All one would need to make the battery is a kit comprised of electrode paste and a laminating machine.

Tags: *Energy, Flexible electronics, Government S&T*

“There is something irreversible about acquiring knowledge; and the simulation of the search for it differs in a most profound way from the reality.” J. ROBERT OPPENHEIMER

### General Fusion targeting commercializing nuclear fusion in about 2020

Next Big Future, 30OCT2013

General Fusion's system uses a sphere, filled with molten lead-lithium that is pumped to form a vortex. Plasma is injected into the vortex, and an array of pistons drives a pressure wave into the centre of the sphere to compress the plasma into fusion conditions. If General Fusion succeeds they plan to produce a fusion system that generates power at about 3-5 cents per kWh. This would be competitive with coal and natural gas.

Tags: Energy, Nuclear energy

### ENVIRONMENTAL SCIENCE

#### Smoke signals: Tracking the rapid changes of wildfire aerosols

PhysOrg.com, 05NOV2013

Brookhaven National Laboratory leads the Biomass Burn Observation Project (BBOP) which is dedicated to measuring the way airborne soot evolves during its first few crucial hours in the sky. The smoke impacts climate directly and indirectly: directly by reflecting and absorbing sunlight, and indirectly by influencing the formation of clouds.

Tags: Environmental science, Climatology, Government S&T

#### Geoengineering the Climate Could Reduce Vital Rains

Science Daily, 31OCT2013

According to a study led by NCAR, trying to resolve the global warming problem through "geoengineering" could result in monsoonal rains in North America, East Asia, and other regions dropping average precipitation by 5-7 percent compared to preindustrial conditions. Globally, average precipitation could decrease by about 4.5 percent.

TECHNICAL ARTICLE

Tags: Environmental science, Government S&T

### FORECASTING

#### Hangout on Air: Which technologies will have the biggest impact by 2025?

KurzweilAI, 02NOV2013

This London Futurists Hangout on Air featured a live discussion between futurists Kevin Russell, Peter Rothman, Riva-Melissa Tez, Clyde DeSouza, and José Luis Cordeiro.

Tags: Forecasting

### INFORMATION TECHNOLOGY

#### Fast and Spacious Helium-Filled Hard Drives Ready for Liftoff

MIT Technology Review, 05NOV2013

California based data-storage company HGST has begun making a six-terabyte helium hard drive that has a 50 percent greater storage capacity and uses about 20 percent less power than conventional hard drives. The secret to this leap forward in performance? Pumping the drives full of helium. Helium reduces friction, vibration, and other mechanical issues that limit the storage density of conventional hard drives.

Tags: Information Technology

### MATERIALS SCIENCE

#### Diamond imperfections pave the way to technology gold

Nanowerk, 04NOV2013

Using two-dimensional electronic spectroscopy on pico- and femto-second time-scales, researchers from UC Berkeley and Lawrence Berkeley National Laboratory have recorded unprecedented observations of energy moving through the atom-sized diamond impurities known as nitrogen-vacancy (NV) centers. The key to a number of highly promising advanced technologies may lie in one of the most common defects in diamonds. TECHNICAL ARTICLE

Tags: Materials science

#### New Chemistry: Drawing and Writing in Liquid With Light

Science Daily, 04NOV2013

Researchers in Finland have manufactured photochemically active polymers which can be dissolved in water or certain alcohols. The polymer chain created includes azo compounds which can be switched from a trans conformation to a cis conformation using light. This discovery is particularly significant for the development of new materials for optics and electronics. TECHNICAL ARTICLE, VIDEO

Tags: Materials science, S&T Finland

#### Synaptic Transistor Learns While It Computes

Science Daily, 02NOV2013

Researchers at Harvard University have created a new type of transistor that mimics the behavior of a synapse. The novel device simultaneously modulates the flow of information in a circuit and physically adapts to changing signals. TECHNICAL ARTICLE

Tags: Materials science, Artificial intelligence

continued...

## NEUROSCIENCE

**Researchers gain new insights into brain neuronal networks**

University of Notre Dame, 04NOV2013

Using brain-wide and consistent tracer data, an international team of researchers (USA, France, Germany, Romania) describe the cortex as a network of connections with a “bow tie” structure characterized by a high-efficiency, dense core connecting with “wings” of feed-forward and feedback pathways to the rest of the cortex. Bow tie arrangement is a typical feature of self-organizing information processing systems. [TECHNICAL ARTICLE](#)

Tags: Neuroscience

**Seeing in the Dark: Most People Can See Their Body's Movement in the Absence of Light**

Science Daily, 31OCT2013

Researchers at the University of Rochester show that our own movements transmit sensory signals that also can create real visual perceptions in the brain, even in the complete absence of optical input. [TECHNICAL ARTICLE](#)

Tags: Neuroscience

**What makes creativity tick?**

Bright Stuff, 30OCT2013

A team of researchers led by a Michigan State University has created a quick but reliable test that can measure a person's creativity from single spoken words. The “noun-verb” test is so simple it can be done by virtually anyone anywhere—even in an MRI machine. While some believe ingenuity is spontaneous, the team suspects there's a lot of hard work going on in the brain even when the proverbial light bulb going off feels effortless.

## FEATURED RESOURCE

**Science Alert**

Besides providing the latest news from Australasian universities and research institutions, the service provides quality feature articles and opinions from qualified Australasian scientific and science writers. [RSS](#)

## PHOTONICS

**World's Most Powerful Terahertz Quantum Cascade Laser**

Science Daily, 30OCT2013

Using a special merging technique researchers in Austria have joined two symmetrical laser structures resulting in a quadruple intensity of laser light. Many molecules absorb light in the terahertz region in a very characteristic way. Because of this, terahertz radiation can be used for chemical detectors. [TECHNICAL ARTICLE 1, 2](#)

Tags: Photonics, Terahertz technology

## QUANTUM SCIENCE

**Viewpoint: A Single-Atom Optical Switch**

American Physical Society, 04NOV2013

Researchers in Austria experimentally demonstrated a microphotonic optical switch that is regulated by just a single atom.

Tags: Quantum science

**The Reins of Casimir: Engineered Nanostructures Could Offer Way to Control Quantum Effect**

Science Daily, 23OCT2013

A collaborative research group of scientists from a number of federal labs and major universities has observed that quantum forces, most notably the Casimir effect, can be increased or lessened by patterning one of the surfaces with nanoscale structures. Controlling these effects may also be necessary for building certain types of quantum computers, and for studying gravity at the microscale.

[TECHNICAL ARTICLE](#)

Tags: Quantum science, Government S&amp;T

## S&amp;T POLICY

**Multi-million pound grant awarded to train UK's future scientific leaders**

Alphagalileo, 05NOV2013

As part of a £100 million investment, revealed yesterday by the Minister for Universities and Sciences, the London DTP (Doctoral Training Partnership) will allow postgraduate students to use environmental sciences to tackle the challenges facing the world today. It is one of 15 new DTPs across the UK, funded by the Natural Environment Research Council (NERC), that were announced as part of NERC's renewed commitment to postgraduate training.

Tags: S&amp;T policy, S&amp;T UK

**NPL leads research project to help deliver 10x faster computer processing speeds**

EurekAlert, 04NOV2013

The European Metrology Research Programme's Nanostrain project brings together public institutions from across Europe supported by global industry leaders, including IBM, to deliver highly accurate measurements of strain in materials at the nano-scale to drive innovation in next generation electronic devices.

Tags: S&amp;T policy, S&amp;T EU

**UK-Russia partnership to develop new Photonics Research Centre**

Alphagalileo, 29OCT2013

A photonics research centre developing the latest in laser and photonic technologies is set to be established through a new UK and Russia university partnership. Aston University (UK) and Novosibirsk State University (Russia)

are world innovators in the fields of optical communications, fibre optics, lasers and non-linear photonics.

*Tags: S&T policy*

## SCIENCE WITHOUT BORDERS

### Can we unify quantum mechanics and gravity?

Physics World, 31OCT2013

The incompatibility of general relativity and quantum mechanics is perhaps the most important open problem in theoretical physics. Sabine Hossenfelder describes how physicists are working to unite these two perspectives in a theory of quantum gravity.

*Tags: Science without borders*

## SENSORS

### Force to Be Reckoned With: Laser Power Measured With Portable Scale

Science Daily, 23OCT2013

Researchers at NIST have demonstrated a novel method for measuring laser power by reflecting the light off a mirrored scale, which behaves as a force detector. This promises a faster, less costly and more portable alternative to conventional methods of calibrating high-power lasers used in manufacturing, the military and research.

*Tags: Sensors, Advanced materials ■*

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This publication is authored and distributed by:

**Dr. Brian Beachkofski**

Director, Office of  
Technical Intelligence (OTI)

**Ms. Hema Viswanath**

OTI Corporate Librarian