



# S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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## FEATURE ARTICLES

### [Theorists predict new state of quantum matter may have big impact on electronics](#)

[Nanowerk, 17DEC2013](#)

As electrons move, they dissipate heat, reducing the distance a signal can travel. DARPA-sponsored researchers under the Mesodynamic Architectures (Meso) program, however, may have found a potential way around this fundamental problem. Meso program researchers at Stanford University recently predicted stanene, 2-D sheets of tin that are only 1-atom thick will support lossless conduction at room temperature. [TECHNICAL ARTICLE](#)

Tags: [Quantum science](#), [Breakthrough technology](#), [Featured Article](#)

### [Revolutionizing Solar Energy: Quantum Waves Found at the Heart of Organic Solar Cells](#)

[Science Daily, 12DEC2013](#)

This is the experimental setup used to generate femtosecond laser pulses which serve as an ultrafast "flash" for the camera so that very rapid phenomenon can be filmed.  
(Credit: Simon Gelinas)

revealing the key to generating "long-lived charges" in organic solar cells—material that could revolutionise solar energy. [TECHNICAL ARTICLE](#)

Tags: [Materials science](#), [Solar energy](#), [Featured Article](#)

An international team of researchers (UK, USA) have been able to tune 'coherence' in organic nanostructures due to the surprise discovery of wavelike electrons in organic materials,

## S&T NEWS ARTICLES

### ADVANCED MANUFACTURING

#### [A 3D-printed key to the factory of the future](#)

[EU R&D News, 17DEC2013](#)

PHOCAM, an EU funded project, focused on two core techniques—3D printing for high-performance ceramics and 3D printing with ultra-high resolution—and achieved remarkable results.

Tags: [Advanced manufacturing](#), [S&T EU](#)

#### [Graphene Production Combined Into One-Step Method for Wafer-Scale Films](#)

[IEEE Spectrum, 12DEC2013](#)

Researchers have developed a technique to grow graphene, dubbed "face-to-face" transfer because the graphene is grown on the copper while the copper sits on top of a silicon substrate. Instead of tearing away the graphene, the copper is etched away while the graphene is lashed to the silicon by bubbles that form capillary bridges. [TECHNICAL ARTICLE](#)

Tags: [Advanced manufacturing](#)

### ADVANCED MATERIALS

#### [Cellulose Nanocrystals Possible 'Green' Wonder Material](#)

[Science Daily, 16DEC2013](#)

Researchers at Purdue University report that the same tiny cellulose crystals that give trees and plants their high strength, light weight and resilience, have now been shown to have the stiffness of steel. The nanocrystals might be used to create a new class of biomaterials with wide-ranging applications, such as strengthening construction materials and automotive components.

[TECHNICAL ARTICLE](#)

Tags: [Advanced materials](#), [Materials science](#)

#### [New graphene treatment could unleash new uses](#)

[MIT News, 15DEC2013](#)

The low-temperature annealing process developed by MIT researchers modifies the distribution of the oxygen atoms,

*continued...*[BACK TO TOP](#)

causing them to form clusters and leaving areas of pure graphene between them, without introducing any disorder to the overall graphene structure—and most importantly, preserving the oxygen content.

*Tags: Advanced materials*

### **Successful graphene synthesis out of single molecules**

Nanowerk, 13DEC2013

An international team of researchers (Germany, Netherlands, UK, Denmark, Greece) succeeded in producing remarkably long, structurally well-defined and liquid-phase-processable graphene nanoribbons (GNRs). GNRs show excellent semiconducting properties. As a consequence, this nanomaterial could optimally be used in electronic devices such as transistors and be far more effective than the silicon currently in use. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, S&T Germany, S&T UK*

### **Novel Bio-Inspired Method to Grow High-Quality Graphene for High-End Electronic Devices**

Science Daily, 12DEC2013

Researchers in Singapore have successfully developed an innovative one-step method to grow and transfer high-quality graphene on silicon and other stiff substrates, opening up opportunities for graphene to be used in high-value applications that are currently not technologically feasible. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials*

### **Solar Cells Made Thin, Efficient and Flexible**

Science Daily, 09DEC2013

A team of researchers from the University of Illinois at Urbana Champaign and the University of Central Florida found a way to create large sheets of nanotextured, silicon micro-cell arrays that hold the promise of making solar cells lightweight, more efficient, bendable and easy to mass produce. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Solar energy*

## AUTONOMOUS SYSTEMS & ROBOTICS

### **Video Friday: REEM-C, Bots of the Past, and Drones Hear Your Screams**

IEEE Spectrum, 13DEC2013

Researchers in Switzerland have outfitted a MAV swarm with directional microphones, giving the drones the ability to localize in on sounds like an emergency whistle.

*Tags: Autonomous systems & robotics*

## BIG DATA

### **Science in 140 characters: using Twitter like a boss**

Science Alert (Australia), 12DEC2013

Numbers of tweets and Facebook likes are no longer the sole obsession of Conversation authors. They now get tallied

by university administrators, funding bodies and journal publishers as “AltMetrics”, and soon academics may be judged on their social media performance as much as they are on their teaching evaluations and grant success.

*Tags: Big data, R&D Funding*

## BIOTECHNOLOGY

### **Scientists Discover Potential Vaccine for Malaria**

Science Daily, 16DEC2013

Researchers in Singapore have identified a region of the malaria parasite which it uses to attach to a healthy blood cell then push itself into the cell. To prevent this invasion, they developed antibodies which can interfere with this invasion process. [TECHNICAL ARTICLE](#)

*Tags: Biotechnology, Biology*

### **Stanford researchers take a step toward developing a ‘universal’ flu vaccine**

EurekAlert, 16DEC2013

Stanford University researchers’ approach arises from a better understanding of the structure of a key protein on the surface of the flu virus, and a new process for making vaccines based on that understanding. They discovered that, whereas the head of the flu virus varies from year to year, the protein stem remains more constant over time.

[TECHNICAL ARTICLE](#)

*Tags: Biotechnology, Biology*

### **World’s Smallest Pacemaker Can Be Implanted without Surgery**

MIT Technology Review, 13DEC2013

New cardiac devices are small enough to be delivered through blood vessels into the heart. Doctors in Austria implanted one such device into a patient. The device is 24 millimeters long and 0.75 cubic centimeters in volume—a tenth the size of a conventional pacemaker.

*Tags: Biotechnology*

### **Programming smart molecules**

Harvard University, 12DEC2013

Harvard university researchers have shown that an important class of artificial intelligence algorithms could be implemented using chemical reactions. These algorithms, which use a technique called “message passing inference on factor graphs,” are a mathematical coupling of ideas from graph theory and probability. Machine-learning algorithms could make chemical reactions intelligent.

[TECHNICAL ARTICLE](#)

*Tags: Biotechnology, Artificial intelligence, Biology*

“Almost everything that distinguishes the modern world from earlier centuries is attributable to science” **BERTRAND RUSSELL**

## COMMUNICATIONS TECHNOLOGY

### Innovative technology addresses wireless interference

NSF News, 16DEC2013

Instead of trying to avoid interference by dividing the spectrum and time among people, researchers at MIT are inventing new technologies that allow people to transmit at the same time in the same part of the spectrum. They designed a “ZigZag” algorithm that reconstructs the content of the competing information packets even in the presence of interference, thus significantly reducing the need to retransmit. More recently, they developed a technology called “MegaMIMO,” which coordinates the transmission of multiple transmitters.

Tags: Communications Technology

## ENERGY

### POPOP: Novel Organic Solar Cells

Science Daily, 13DEC2013

An interdisciplinary team of researchers in Germany are working on improving the basic understanding and developing new architectures for semitransparent and non-transparent solar cells and modules.

Tags: Energy, S&T Germany, Solar energy

## EXPLOSIVES

### Smashing science: Scientists discover how explosives respond to shockwaves

PhysOrg.com, 12DEC2013

The Lawrence Livermore National Laboratory researchers demonstrated that 50 trillionths of a second (50 picoseconds) after the peroxide was shocked it begins to tear apart. The chemical bonds were completely broken by 100 picoseconds. The temperature increased by more than 1,500 degrees and the explosive pressure wave spiked to more than 200,000 atmospheres.

Tags: Explosives, Government S&T

## FORECASTING

### IBM's predictions for next five years: everything will learn

KurzweilAI, 17DEC2013

This year's IBM 5 in 5 explores the idea that everything will learn—driven by a new era of cognitive systems where machines will learn, reason and engage with us in a more naturalized and personalized way. These innovations are beginning to emerge enabled by cloud computing, big data analytics and learning technologies all coming together, says IBM.

Tags: Forecasting

### Digital global intelligence on the future of the world in the palm of your hand

KurzweilAI, 11DEC2013

The Millennium Project's Global Futures Intelligence System presents distillations of the present situation, prospects, and strategies to address issues ranging from climate change to governance, science and technology, economics, ethics, education and other areas.

Tags: Forecasting

## IMAGING TECHNOLOGY

### That thing attached to your hand? It might be doomed

Harvard University, 11DEC2013

A Harvard professor has had his finger on the pulse of the industry since his work developing the CMOS image sensors common in cellphone cameras. The Gazette asked him about prospects near and far in personal tech.

Tags: Imaging technology

## INFORMATION TECHNOLOGY

### Controlling PCs and Tablets With Hand Movements

Science Daily, 12DEC2013

Researchers in Scandinavia are working to develop interaction between themselves and mobiles/ iPads -- which does not require touching the display. They have been able to scroll through pages for some time. Now they are working on selecting and moving objects, or saying stop by raising a hand.

Tags: Information Technology

## MATERIALS SCIENCE

### Graphene-based nano-antennas may enable networks of tiny machines

Nanowerk, 12DEC2013

By taking advantage of the unique electronic properties of graphene, researchers at the Georgia Institute of Technology believe they're on track to connect devices powered by small amounts of scavenged energy. Networks of nanometer-scale machines offer exciting potential applications in medicine, industry, environmental protection and defense.

Tags: Materials science

### Negative resistivity leads to positive resistance in the presence of a magnetic field

Nanowerk, 11DEC2013

Researchers at Georgia State University report that in the presence of a magnetic field, negative resistivity can

*continued...*

produce a positive resistance, along with a sign reversal in the Hall effect, in GaAs/AlGaAs semiconductor devices. This result will help to further understand the properties of systems exhibiting negative resistivity, and more insight into the intricacies of the Hall effect. [TECHNICAL ARTICLE](#)

*Tags: Materials science*

## MICROELECTRONICS

### [Brain-Inspired Chips Will Allow Smartphones to Understand Us](#)

MIT Technology Review, 17DEC2013

The next major step in smartphone evolution is obvious: the devices will become intelligent assistants that can perceive the environment and follow our commands. This will become possible thanks to progress in building chips inspired by the functioning of mammalian brains.

[RELATED ARTICLE: Thinking in silicon](#)

*Tags: Microelectronics, Communications Technology*

### [Low-power tunneling transistor for high-performance devices at low voltage](#)

Nanowerk, 12DEC2013

A new device developed by a team of researchers from Penn State, NIST and industry uses the quantum mechanical tunneling of electrons through an ultrathin energy barrier to provide high current at low voltage. Tunnel field effect transistors are considered to be a potential replacement for current CMOS transistors.

*Tags: Microelectronics, Advanced materials*

## FEATURED RESOURCE

### [MIT World](#)

Which ideas and innovations can change the world? MIT World™ answers that question by publishing key presentations by the MIT faculty and guest speakers who are shaping the future. These free, on-demand videos, are available 24/7 to viewers worldwide.

## NEUROSCIENCE

### [Brain Neurons Subtract Images, Use Differences](#)

Science Daily, 17DEC2013

Researchers in Germany demonstrated that the visual cortex suppresses redundant information and saves energy by frequently forwarding image differences. [TECHNICAL ARTICLE](#)

*Tags: Neuroscience*

### [Even when test scores go up, some cognitive abilities don't](#)

MIT News, 11DEC2013

In a study of nearly 1,400 eighth-graders in the Boston public school system, the researchers at MIT found that some schools have successfully raised their students'

scores on the Massachusetts Comprehensive Assessment System (MCAS). However, those schools had almost no effect on students' performance on tests of fluid intelligence skills, such as working memory capacity, speed of information processing, and ability to solve abstract problems.

*Tags: Neuroscience, STEM*

## PHOTONICS

### [A fleeting flash of light](#)

RIKEN Research, 13DEC2013

A team of researchers from Japan and Germany have created a table-top light source that can generate attosecond optical pulses without the complicated level of stabilization required by alternative approaches. It provides an important tool for studying the interaction between light and matter. [TECHNICAL ARTICLE](#)

*Tags: Photonics, S&T Germany, S&T Japan*

## QUANTUM SCIENCE

### [Scientists demonstrate Bose-Einstein condensation for the first time using a plastic film](#)

Nanowerk, 10DEC2013

Researchers at IBM have demonstrated a complex quantum mechanical phenomenon using a luminescent polymer similar to the materials in light emitting displays used in many of today's smartphones. This discovery has potential applications in developing novel optoelectronic devices including energy-efficient lasers and ultra-fast optical switches. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, Materials science*

## S&T POLICY

### [Nanotechnology looms as the next pervasive technology](#)

Nanowerk, 13DEC2013

Several NNI leaders spoke with SIGNAL Magazine, about the potential that nanotechnology will also offer health care and commercial sectors. The National Nanotechnology Initiative (NNI), is engaging industry, academic partners and international participants, and aims at moving discoveries from the laboratory into products that benefit both the military and public.

*Tags: S&T policy, Government S&T*

## SCIENCE WITHOUT BORDERS

### [Savvy bar-tailed godwit equipped for climate challenge](#)

BBC News, 14DEC2013

The bar-tailed godwit makes the biggest no-stop migration, flying 11,000km from Alaska to New Zealand every autumn. The bird makes use of tailwinds on the backsides of low-pressure systems passing across the northern

*continued...*

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Pacific. Researchers at the University of Illinois at Urbana Champaign found that in the future the net tailwind index will show some degradation. Tagging studies have demonstrated also that the godwit seems to have a knack of picking the optimum moment whenever it does arise.

*Tags: Science without borders, Climatology*

### **Wikipedia's Secret Multilingual Workforce**

**MIT Technology Review, 13DEC2013**

Wikipedia's various language editions often carry entirely different content. This problem is known as self-focus bias and it places a significant limit on the access to knowledge that Wikipedia provides. Now one researcher has identified a small band of multilingual editors who are working to change that. [TECHNICAL ARTICLE](#)

*Tags: Science without borders*

## **SENSORS**

### **A Terahertz Generator With the Highest Signal Quality**

**Science Daily, 16DEC2013**

Researchers in Spain are developing an innovative Terahertz generator that improves signal quality by one million times as compared to the best device of this kind currently on the market. This technology could be applied in the areas of biomedicine, transportation safety, industry and radio astronomy, among others. [TECHNICAL ARTICLE](#)

*Tags: Sensors, Terahertz technology*

### **Unconventional thermal cloak hiding an object outside the cloak**

**Institute of Physics, 11DEC2013**

Researchers in China have exploited a class of unconventional thermal cloaks that enable the cloaked object to feel the external heat flow. Finite-element simulations in two dimensions show the desired cloaking effect. The underlying mechanism originates from the complementary effect of thermal metamaterials with negative thermal conductivities.

*Tags: Sensors, S&T China*

### **Cellphone based Portable Bacteria Pre-Concentrating microfluidic Sensor and Impedance Sensing System**

**arXiv.org, 02DEC2013**

Researchers at the University of Illinois at Urbana Champaign report the design, fabrication and testing of a low-cost, miniaturized and sensitive bacteria sensor based on electrical impedance spectroscopy method using a smartphone as the platform. It lowered the detection limit to 10 bacterial cells per milliliter.

*Tags: Sensors ■*

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