



# S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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## FEATURE ARTICLES

### [Laser the size of a virus particle: Miniature laser operates at room temperature and defies the diffraction limit of light](#)

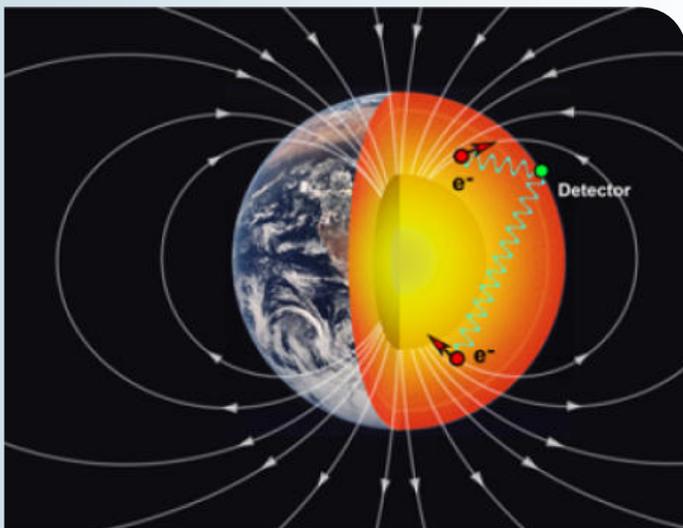
[Science Daily, 25FEB2013](#)

Researchers at Northwestern University made the lasing cavity out of metal nanoparticle dimers—structures with a 3-D ‘bowtie’ shape which enabled them to manufacture single laser devices that are the size of a virus particle and that operate at room temperature. These plasmonic nanolasers could be readily integrated into silicon-based photonic devices, all-optical circuits and nanoscale biosensors. [TECHNICAL ARTICLE](#)

[Tags: Photonics, Featured Article](#)

### [Particle physics research sheds new light on possible ‘fifth force of nature’](#)

[Science Daily, 24FEB2013](#)



This picture depicts the long-range spin-spin interaction (blue wavy lines) in which the spin-sensitive detector on Earth's surface interacts with geoelectrons (red dots) deep in Earth's mantle. The arrows on the geoelectrons indicate their spin orientations, opposite that of Earth's magnetic field lines (white arcs). Credit: Illustration: Marc Airhart (University of Texas at Austin) and Steve Jacobsen (Northwestern University).

A team of researchers led by Amherst College has established new limits on what scientists call “long-range spin-spin interactions” between atomic particles which have not yet been seen. Their observation would constitute the discovery of a “fifth force of nature” (in addition to the four known fundamental forces: gravity, weak, strong and electromagnetic) and would suggest the existence of new particles, beyond those presently described by the Standard Model of particle physics.

[TECHNICAL ARTICLE](#)

[Tags: Breakthrough technology, Materials science, Particle physics, Featured Article](#)

## S&T NEWS ARTICLES

### ADVANCED MANUFACTURING

#### [MIT report identifies keys to new American innovation](#)

[MIT News, 24FEB2013](#)

An intensive, long-term study by a group of MIT scholars suggests that a renewed commitment to research and development in manufacturing, sometimes through creative new forms of collaboration, can spur innovation and growth in the United States as a whole. [REPORT](#)

[Tags: Advanced manufacturing](#)

#### [Using 3-D printing and injectable molds, bioengineered ears look and act like the real thing](#)

[Science Daily, 21FEB2013](#)

Bioengineers and physicians at Cornell University have described how 3-D printing and injectable gels made of living cells can fashion ears that are practically identical to a human ear. Over a three-month period, these flexible ears grew cartilage to replace the collagen that was used to mold them. [TECHNICAL ARTICLE](#)

[Tags: Advanced manufacturing](#)

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## ADVANCED MATERIALS

### **Creating next-generation materials able to operate in the toughest environments**

Science Daily, 24FEB2013

Academics from Loughborough's Department of Materials will work with Imperial College London and Queen Mary University on the Engineering and Physical Sciences Research Council (EPSRC) funded project. Ultimately the research will allow new and revolutionary compositions, microstructures and composite systems to be designed, manufactured and tested.

*Tags: Advanced materials, R&D Funding, S&T UK*

### **Graphene multiplies the power of light**

Nanowerk, 24FEB2013

An international team of researchers led by Spain demonstrates that graphene is able to convert a single photon that it absorbs into multiple electrons that could drive electric current—a very promising discovery that makes graphene an important alternative material for light detection and harvesting technologies. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials*

## AUTONOMOUS SYSTEMS & ROBOTICS

### **Teaching robots lateral thinking: New algorithms could help household robots work around their physical shortcomings**

MIT News, 25FEB2013

MIT Researchers allow modification of their algorithms, through application programming interfaces that would allow other researchers to plug in parameters describing the physical behavior of new types of objects. But the ultimate goal is for the robot itself to infer the relevant properties of objects by lifting, shoving, or otherwise manipulating them.

*Tags: Autonomous systems & robotics*

### **Video Friday: Disaster Superheroes, Balancing Cubes, and senseFly Tackles the Matterhorn**

IEEE Spectrum, 22FEB2013

When we saw senseFly's eBee at Parrot's booth at CES in January, they told us that it was incredibly easy to use. Turns out it's so easy to use that you can take it skiing with you, if you want to document your favorite runs in 3D.

*Tags: Autonomous systems & robotics*

### **Insects inspiring new technology**

Alpha Galileo Foundation, 21FEB2013

Researchers in the UK have created a computerised system which allows for autonomous navigation of mobile robots based on the locust's unique visual system. Locusts have a distinctive way of processing information through electrical and chemical signals, giving them an extremely fast and accurate warning system for impending collisions. The insect has incredibly powerful data processing systems

built into its biology, which can in theory be recreated in robotics.

*Tags: Autonomous systems & robotics, Biomimetics*

## COMMUNICATIONS TECHNOLOGY

### **Spectrum-Stretching Tunable Antennas to the Rescue**

IEEE Spectrum, 24FEB2013

Smart receivers seek out quiet spots in the noisy, overcrowded airwaves. A tunable, or active, antenna with improved efficiency needs less transmission power from the phone's amplifier and saves battery life. Because it is more efficient, it gets better service and drops fewer calls. Improving efficiency with active antennas should also lead to higher data rates, meaning faster downloads.

*Tags: Communications Technology*

## ENERGY

### **China has 29 nuclear reactors under construction (40% of the world total).**

Next Big Future, 24FEB2013

Construction on the Pebble Bed reactor began in December. The design came from Beijing's Tsinghua University. If successful, it would be the first full-size prototype of this technology. If unsuccessful, it would be a costly, dangerous mess to clean up. Germany's pebble-bed prototype, which was never operational, cost €5.5 billion (\$7.3 billion) to decontaminate.

*Tags: Energy, Nuclear energy, S&T China*

### **Gold Nanorods a whole new way of harvesting solar energy**

Nanowerk, 24FEB2013

In the technology developed by researchers at UC Santa Barbara it is not semiconductor materials that provide the electrons and venue for the conversion of solar energy, but a "forest" of gold nanorods. Gold nanorods were capped with a layer of crystalline titanium dioxide decorated with platinum nanoparticles, and set in water. A cobalt-based oxidation catalyst was deposited on the lower portion of the array. [TECHNICAL ARTICLE](#)

*Tags: Energy, Advanced materials, Solar energy*

### **Multijunction solar cell could exceed 50% efficiency goal**

PhysOrg.com, 21FEB2013

A team of researchers led by CalTech has developed multijunction solar cells, in which each junction or subcell absorbs and converts sunlight from a specific region of the spectrum. The subcells can be stacked on top of one another so that sunlight first strikes the highest bandgap subcell, which is tuned to light with the shortest wavelengths or highest energies.

*Tags: Energy, Solar energy*

*continued...*

“It is far better to grasp the Universe as it really is than to persist in delusion, however satisfying and reassuring.” CARL SAGAN

## ENVIRONMENTAL SCIENCE

### [New device better traps viruses, airborne pathogens](#)

e! Science News, 24FEB2013

A new device developed by researchers at Washington University incorporates soft X-ray irradiation as a component of the electrostatic precipitation process currently used to remove large particles from airflows. The soft X-ray ensures very efficient charging of the particles over a broad range of sizes and their capture in the SXC ESP.

Tags: Environmental science

### [Geoengineering by coalition to mitigate global warming](#)

Science Daily, 21FEB2013

Solar geoengineering is a proposed approach to reduce the effects of climate change due to greenhouse gasses by deflecting some of the sun's incoming radiation. This type of proposed solution carries with it a number of uncertainties. [ARTICLE](#)

Tags: Environmental science, Climatology

## FORECASTING

### [EURO invites papers related to forecasting EUROPA research, 25FEB2013](#)

The Forecasting Stream of Special Sessions at the 26th EURO-INFORMS European Conference on Operational Research, July 1-4, 2013 in Rome attempts to capture the plethora of methodological approaches and application areas in a series of coherent special sessions, relevant both from an academic and a practitioner perspective.

[CONFERENCE SITE](#)

Tags: Forecasting

## GOVERNMENT S&T

### [Experimental Aircraft Program to Develop the Next Generation of Vertical Flight](#)

DARPA News, 25FEB2013

Rather than tweaking past designs, DARPA is looking for true cross-pollinations of designs and technologies from the fixed-wing and rotary-wing worlds. The elegant confluence of these engineering design paradigms is where this program should find some interesting results. [BAA](#)

Tags: Government S&T, DARPA

## IMAGING TECHNOLOGY

### [A Better View Underground](#)

American Physical Society, 24FEB2013

Researchers in the Netherlands present a general

derivation of their method, which works on an arbitrary number of layers, made of any material, and with interfaces of any shape. As a test, the researchers performed a computer simulation for a specific 2D case with eight geological layers having a variety of sound speeds and various hills and valleys at their interfaces. The team found that the simulated signals agreed to a high degree of accuracy with those predicted by the theory. [TECHNICAL ARTICLE](#)

Tags: Imaging technology

### [New Imaging Device That Is Flexible, Flat, And Transparent](#)

Science Newsline, 21FEB2013

An Austrian research team has developed an entirely new way of capturing images based on a flat, flexible, transparent, and potentially disposable polymer sheet.

Tags: Imaging technology

## INFORMATION TECHNOLOGY

### [Writing without keyboard: Handwriting recognition on the wrist](#)

Science Daily, 21FEB2013

How about simply writing in the air! This idea drove the development of “airwriting” by researchers in Germany. Sensors attached to a glove record hand movements, a computer system captures relevant signals and translates them into text. Acceleration sensors and gyroscopes are attached to the thin glove. Contrary to systems based on cameras, these sensors are very small, mobile, and robust. Previous approaches mainly focused on the recognition of single gestures assigned to certain commands. Current approach goes far beyond: For every letter of the alphabet, a statistical model of the characteristic signal pattern is stored.

Tags: Information Technology, S&T Germany

## MATERIALS SCIENCE

### [Newly observed properties of vacuums: Light particles illuminate the vacuum](#)

Science Daily, 27FEB2013

Researchers in Finland have succeeded in showing experimentally that vacuums have properties not previously observed. According to the laws of quantum mechanics, it is a state with abundant potentials. Vacuums contain momentarily appearing and disappearing virtual pairs, which can be converted into detectable light particles. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Finland

### **Non-brittle glass possible: In probing mysteries of glass, researchers find a key to toughness**

Science Daily, 27FEB2013

Focusing on a new group of glasses known as bulk metallic glasses (BMGs)—metal alloys, or blends, that can be extremely pliable yet also as strong as steel—researchers at Yale University studied the effect of a so-called critical fictive temperature (CFT) on the glasses' mechanical properties at room temperature. The finding applies theoretically to all glasses, not metallic glasses only.

[TECHNICAL ARTICLE](#)

*Tags: Materials science*

### **Researchers develop new method of controlling nanodevices**

Nanowerk, 25FEB2013

Using a composite of nickel nanocrystals coupled with a single crystal of piezoelectric material, researchers at UCLA have developed a method for switching tiny magnetic fields on and off with an electric field. The findings could potentially change the way electromagnetic devices are designed in the future. [TECHNICAL ARTICLE](#)

*Tags: Materials science*

### **Revolutionary type of gel discovered**

Science Daily, 25FEB2013

Gels consist of a network of solids that can retain up to 99% of liquid while maintaining their shape. Researchers in Switzerland have shown how to combine two gels in such a way that they can monitor and change, almost at will, the properties of the new combined material. Their discovery marks an important step for materials used in healthcare, high-tech, and the cosmetics industry.

[TECHNICAL ARTICLE](#)

*Tags: Materials science, S&T Switzerland*

## FEATURED RESOURCE

### **Report Linker**

Reportlinker is a search engine, which provides access to the largest online collection of industry, company and country reports available. It provides full access to more than 1 million reports, published by 200,000 reliable public sources.

## MICROELECTRONICS

### **Make Way for Flexible Silicon Chips**

IEEE Spectrum, 25FEB2013

Researchers in Germany are developing an additive technique of growing crystalline silicon, layer by layer, on a foundation laced with sealed cavities. The new technique could lead to many high-performance flexible applications, including displays, sensors, wireless interfaces, energy harvesting, and wearable biomedical devices.

*Tags: Microelectronics, S&T Germany*

### **Non-volatile bistable memory circuits for highly energy-efficient CMOS logic systems**

Science Daily, 25FEB2013

Researchers in Japan have proposed a new architecture of power-gating using non-volatile SRAM (NV-SRAM) and non-volatile FF (NV-FF) circuits, called non-volatile power-gating, so that the size of logic circuit domains for power-gating is optimally designed, supply voltages to the domains are cut at the optimum times, and the energy cost of the logic circuits is worthwhile. [TECHNICAL ARTICLE](#)

*Tags: Microelectronics, S&T Japan*

### **Nanopaper transistors for the coming age of flexible and transparent electronics**

Nanowerk, 21FEB2013

Researchers at the University of Maryland have shown that flexible organic field-effect transistors (OFETs) with high transparency and excellent mechanical properties can be fabricated on tailored nanopapers. The crucial advantages of nanopapers are their better thermal stability and the fact that they tolerate a much higher processing temperature than plastic. [TECHNICAL ARTICLE](#)

*Tags: Microelectronics*

## NEUROSCIENCE

### **Training computers to understand the human brain**

Science Daily, 26FEB2013

An international team of researchers led by Japan has completed a study using fMRI datasets to train a computer to predict the semantic category of an image. The participants underwent fMRI brain scan while they were silently labelling pictures of animals and tools they were asked to view. The resulting scans were analysed using algorithms that identified patterns relating to the two separate semantic groups (animal or tool). After 'training' the algorithms in this way using some of the auditory session data, the computer correctly identified the remaining scans 80-90% of the time. [TECHNICAL ARTICLE](#)

*Tags: Neuroscience*

### **Human cognition depends upon slow-firing neurons**

Science Daily, 21FEB2013

Good mental health and clear thinking depend upon our ability to store and manipulate thoughts on a sort of "mental sketch pad." In a new study, researchers at Yale University describe the molecular basis of this ability—the hallmark of human cognition—and describe how a breakdown of the system contributes to diseases such as schizophrenia and Alzheimer's disease. [TECHNICAL ARTICLE](#)

*Tags: Neuroscience*

*continued...*

## PHOTONICS

**Detecting single infrared photons with 93% system efficiency**

Nature Photonics, 24FEB2013

Researchers at NIST have developed a fibre-coupled single-photon detection system that uses superconducting nanowire single-photon detectors and closely approaches the ideal performance of single-photon detectors. The detector system has a system detection efficiency (including optical coupling losses) greater than 90% in the wavelength range  $\lambda = 1,520\text{--}1,610$  nm, with a device dark count rate (measured with the device shielded from any background radiation) of  $\sim 1$  c.p.s., timing jitter of  $\sim 150$  ps full-width at half-maximum (FWHM) and reset time of 40 ns.

Tags: Photonics, Government S&amp;T

## QUANTUM SCIENCE

**Quantum algorithm breakthrough: Performs a true calculation for the first time**

Science Daily, 24FEB2013

An international team of scientists led by Austria has demonstrated a quantum algorithm that performs a true calculation for the first time. Quantum algorithms could one day enable the design of new materials, pharmaceuticals or clean energy devices. TECHNICAL ARTICLE

Tags: Quantum science

**Quantum teleportation using a light-emitting diode**

Nature Photonics, 24FEB2013

Researchers in the UK demonstrate teleportation of single photonic qubits, mediated by individual pairs of entangled photons generated by an electrically driven entangled light source realized by embedding a single semiconductor quantum dot within a light-emitting diode. Teleportation is achieved with six general input states, with asymmetrically distributed fidelities, and an average fidelity above the limit possible with classical light.

Tags: Quantum science, S&amp;T UK

**Quantum dots that assemble themselves**

Science Daily, 21FEB2013

Researchers from DOE's National Renewable Energy Laboratory have demonstrated a process whereby quantum dots can self-assemble at optimal locations in nanowires, a breakthrough that could improve solar cells, quantum computing, and lighting devices. TECHNICAL ARTICLE

Tags: Quantum science

## S&amp;T POLICY

**Nanotechnology in Japan—companies, research, and university labs**

Nanowerk, 21FEB2013

Due to years of great investment, Japan has gained a significant position in nanotechnologies. Besides a governmental

investment, a huge private sector investment made Japan an attractive place for nanotechnology commercialization.

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

**Report views climate change as national security issue**

Harvard University, 21FEB2013

Researchers at Harvard and NOAA examine connections between global climate change, national security, and politics. During the next decade, the report concludes, climate change could have wide-reaching effects on everything from food, water, and energy supplies to critical infrastructure and economic security. REPORT

Tags: S&amp;T policy, Climatology

## SENSORS

**Here Are The (Rumored) Specs for the Next Generation Kinect Sensor**

IEEE Spectrum, 21FEB2013

Kinect changed the game for robotics, will the Kinect 2 change it again? There are also rumors of improved skeletal tracking, which can track six people (up from two), can identify occluded joints, identify some joint rotations, and pick out thumbs and fingers well enough to be able to tell an open hand from a closed one.

Tags: Sensors

## STEM

**International Team Targets Innovations in STEM Learning**

NSF News, 25FEB2013

Students in Finland have a reputation for doing well on international assessments in science and mathematics. A new research collaboration between the US and Finland is aimed at advancing the best ideas from both sides of the ocean, with the goal of bringing new innovations to science, technology, engineering and mathematics (STEM) education in environments from kindergarten.

Tags: STEM ■

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