



# S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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## FEATURE ARTICLES

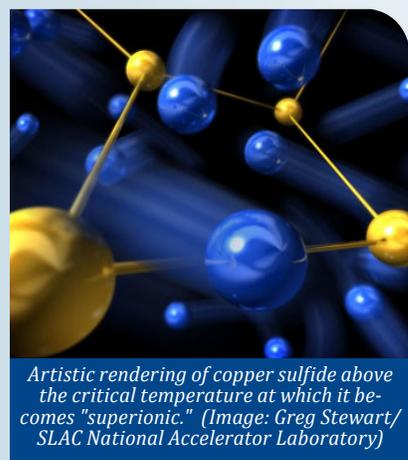
### [Invisible tool enables new quantum experiments](#)

[Nanowerk, 11FEB2013](#)

Researchers at the University of Vienna, Austria have succeeded in constructing a novel matter wave interferometer which enables new quantum studies with a broad class of particles, including atoms, molecules and nanoparticles. These lumps of matter are exposed to three pulsed laser light gratings which are invisible to the human eye, exist only for a billionth of a second and never simultaneously. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, S&T EU, Featured Article*

### [Superionic nanoswitching: the tiniest materials could enable fastest electronics](#)



Artistic rendering of copper sulfide above the critical temperature at which it becomes "superionic." (Image: Greg Stewart/SLAC National Accelerator Laboratory)

[Nanowerk, 09FEB2013](#)

SLAC and Stanford researchers have determined that a material that could enable faster memory chips and more efficient batteries can switch between high and low ionic conductivity states much faster than previously thought. The key is to use extremely

small chunks of it. [TECHNICAL ARTICLE](#)

*Tags: Communications Technology, Featured Article*

### [EmDrive: China's radical new space drive](#)

[Wired UK, 08FEB2013](#)

Scientists in China have built and tested a radical new space drive. It could radically change the satellite industry. Satellites are just the start: with superconducting components, this technology could generate the thrust to drive everything from deep space probes to flying cars. And it all started with a British engineer

whose invention was ignored and ridiculed in his home country. [TECHNICAL ARTICLE](#)

*Tags: Foreign S&T, S&T China, Space technology, Featured Article*

## S&T NEWS ARTICLES

### ADVANCED MATERIALS

#### ['Invisible' particles could enhance thermoelectric devices](#)

[MIT News, 10FEB2013](#)

Researchers at MIT are tuning the composition, dimensions and density of the embedded nanoparticles to maximize the thermoelectric properties of the material. Their method also draws upon optical cloaking methods to embed particles that could reduce the material's thermal conductivity while keeping its electrical conductivity high. With improved efficiency, thermoelectric devices may have more widespread use. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials*

#### [A review of the rapidly evolving field of topological insulator hybrid structures](#)

[Bright Stuff Physics, 09FEB2013](#)

Topological insulators are novel materials that are insulating in the bulk but have surface states that are conducting. These surface states are topologically protected and possess several intriguing properties with the promise of potential applications. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials*

### AUTONOMOUS SYSTEMS & ROBOTICS

#### [Video Friday: Exploding Soft Robots, Chatbot Movie Scripts, and Quadrotor Demos](#)

[IEEE Spectrum, 08FEB2013](#)

How do you instantly make a robot more awesome? Explosives. And there's more, it's Video Friday.

*Tags: Autonomous systems & robotics*

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## BIG DATA

**Extracting insights from the shape of complex data using topology**

Nature Scientific Reports, 09FEB2013

This paper applies topological methods to study complex high dimensional data sets by extracting shapes (patterns) and obtaining insights about them. Our method combines the best features of existing standard methodologies such as principal component and cluster analyses to provide a geometric representation of complex data sets.

Tags: *Big data***Solving big-data bottleneck: Scientists team with business innovators to tackle research hurdles**

Science Daily, 09FEB2013

Researchers from Harvard Medical School and London School of Business have demonstrated that a crowd-sourcing platform pioneered in the commercial sector can solve a complex biological problem more quickly than conventional approaches—and at a fraction of the cost.

TECHNICAL ARTICLE

Tags: *Big data***Beware the Big Errors of ‘Big Data’**

Wired, 08FEB2013

The problem with big data is not unlike the problem with observational studies in medical research. In observational studies, statistical relationships are examined on the researcher's computer. In double-blind cohort experiments, however, information is extracted in a way that mimics real life.

Tags: *Big data*

## BIOTECHNOLOGY

**Cell circuits remember their history**

EurekAlert, 11FEB2013

MIT engineers have created genetic circuits in bacterial cells that not only perform logic functions, but also remember the results, which are encoded in the cell's DNA and passed on for dozens of generations.

Tags: *Biotechnology, Biology*

## COMMUNICATIONS TECHNOLOGY

**Terahertz (THz) Wireless Systems for Space Applications**

NASA News, 12FEB2013

Due to the vast available multiple gigahertz (GHz) broad bandwidths, THz radios offer the possibility for wireless transmission of high data rates. Multi-Gigabits per second (MGbps) broadband wireless access based on THz waves are closer to reality. TECHNICAL ARTICLE

Tags: *Communications Technology, Terahertz technology***Congested Frequencies: How to Improve Bandwidth Access for Military and Commercial Use**

DARPA News, 09FEB2013

DARPA's Shared Spectrum Access for Radar and Communications (SSPARC) program aims to improve radar and communications capabilities for military and commercial users by creating technical solutions to enable spectrum sharing.

Tags: *Communications Technology, DARPA*

## ENERGY

**New material promises better solar cells**

Science Daily, 12FEB2013

An international team of researchers at the Vienna University of Technology has now shown that layers of oxide heterostructures can be used to create a new kind of extremely efficient ultra-thin solar cells. TECHNICAL ARTICLE

Tags: *Energy, Materials science, Solar energy***New world record efficiency for thin film silicon solar cells**

Science Daily, 12FEB2013

Researchers have reached a remarkable 10.7 percent efficiency single-junction microcrystalline silicon solar cell, clearly surpassing the previous world record of 10.1 percent held by the Japanese since 1998. Such significant efficiency was achieved with less than two micrometers of photovoltaic active material—100 times less than with standard techniques.

Tags: *Energy, Solar energy*

## IMAGING TECHNOLOGY

**Visualizing biological networks in 4-D: Unique microscope captures motion of DNA structures**

Science Daily, 12FEB2013

Researchers at CalTech have developed techniques for visualizing the behavior of biological nanostructures, like DNA networks, in both space and time, allowing them to directly measure stiffness and map its variation throughout the network. The technique has the potential for broad applications in biological assemblies, and the materials science of nanostructures. TECHNICAL ARTICLE

Tags: *Imaging technology, Biology, Breakthrough technology***Researchers achieve breakthrough in nanoprecision imaging**

Nanowerk, 11FEB2013

Researchers at the University of Maryland describe a novel technique for imaging far below the diffraction limit by using a particle that is much smaller than the wavelength of light as an optical probe. The breakthrough has enabled

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“Technology feeds on itself. Technology makes more technology possible.”

ALVIN TOFFLER

the researchers to capture nanoscale measurements with a spatial accuracy of 12 nanometers. [TECHNICAL ARTICLE](#)

*Tags: Imaging technology, Breakthrough technology*

## INFORMATION TECHNOLOGY

### [How “Bullet Time” Will Revolutionise Exascale Computing](#)

[MIT Technology Review](#), 12FEB2013

Human senses have a limited bandwidth—our brains can receive information from the external world at roughly gigabit rates. Exascale data rates simply overwhelms us. Researchers in Japan propose using “bullet time”, the Hollywood filming technique made famous by movies like The Matrix. Bullet time is a special effect that slows down ordinary events while the camera angle changes as if it were flying around the action at normal speed.

*Tags: Information Technology*

## MATERIALS SCIENCE

### [High-performance gas sensors with temperature measurement](#)

[Nature Scientific Reports](#), 12FEB2013

There are a number of gas ionization sensors using carbon nanotubes as cathode or anode. Their applications are greatly limited by their multi-valued sensitivity. Here we describe a triple-electrode structure featuring two electric fields with opposite directions, which enable us to overcome the multi-valued sensitivity problem at 1 atm in a wide range of gas concentrations.

*Tags: Materials science*

### [Mainz Scientists Confirm Original Tetrahedral Model of the Molecular Structure of Water](#)

[Science Newslines](#), 12FEB2013

Researchers in Germany have confirmed the original model of the molecular structure of water postulated 100 years ago and have thus made it possible to resolve a long-standing scientific controversy about the structure of liquid water.

*Tags: Materials science*

### [Revolutionary type of gel discovered](#)

[Science Daily](#), 12FEB2013

Researchers in Switzerland have developed a method to combine two gels in such a way that they can monitor and change, almost at will, the properties of the new combined material. This discovery opens the door to a great deal of applications, for example, by associating molecules with specific electromagnetic properties, but also by altering the geometry of the particles network. [TECHNICAL ARTICLE](#)

*Tags: Materials science, S&T Switzerland*

### [Spotting the invisible cracks in wind turbines](#)

[Science Daily](#), 12FEB2013

Researchers in Germany developed a method which enabled them to distinguish between dynamics attributed to mechanical properties such as stiffness of the blade and those attributed to interfering noise, such as turbulence.

[TECHNICAL ARTICLE](#)

*Tags: Materials science, S&T Germany*

### [Understanding anti-corrosion paint](#)

[Nanowerk](#), 12FEB2013

Researchers in UK have revealed detailed 3D images of an important industrial coating that is used to reduce corrosion of ship hulls. The work allows automatic identification of aluminium, talc, pigment and remaining filler components in the image, based solely on X-ray refractive data. [TECHNICAL ARTICLE](#)

*Tags: Materials science, S&T UK*

### [Researchers strain to improve electrical material and it's worth it](#)

[EurekAlert](#), 11FEB2013

University of Illinois at Urbana-Champaign researchers have devised a method of making ferroelectric thin films with twice the strain, resulting in exceptional performance. The researchers created graded films by gradually shifting the composition of PZT. The large strain gives the films a built-in electric field, opening the door for new applications. [TECHNICAL ARTICLE](#)

*Tags: Materials science*

### [Insights into lead nanoparticles as an advanced semiconductor material](#)

[Nanowerk](#), 09FEB2013

Indian researchers have developed a new metallic semiconductor for solar cells, optoelectronic, power and other semiconductor devices. Photoluminescence study of the material indicates the emission of photon and suggests presence of bandgap in the material. This confirms semiconducting properties. [TECHNICAL ARTICLE](#)

*Tags: Materials science*

### [New classes of magnetoelectric materials promise advances in computing technology](#)

[Science Daily](#), 09FEB2013

Physicists at the Argonne National Laboratory have developed new methods for controlling magnetic order in a particular class of materials known as “magnetoelectrics.” They focused on the compound EuTiO<sub>3</sub> (europium-titanium oxide). Europium and titanium combine to control the two properties. The position of the titanium influences

*continued...*

the electric behavior, while the europium generates the magnetic nature. [TECHNICAL ARTICLE](#)

*Tags: Materials science, Government S&T, Information technology*

### [Electricity Gives Bubbles Super Strength— Science Shot](#)

[Science Magazine](#), 08FEB2013

When researchers in France trapped a soap bubble between two platinum electrodes and cranked up the voltage, the fluid reversed direction and actually flowed up, against the force of gravity. The newly strong and stable bubbles could live for hours. This whimsical experiment could help scientists create more efficient labs-on-chips.

[TECHNICAL ARTICLE](#)

*Tags: Materials science*

## FEATURED RESOURCE

### [Science Newswire](#)

The site evaluates smart web application technologies, such as machine learning, data clustering, semantic analysis, etc. Software algorithms classify articles by categories, and select appropriate related stories for each. [Newsfeeds](#)

## MICROELECTRONICS

### [Biological connections in microelectronics](#)

[Science Daily](#), 12FEB2013

Biologists and physicists in France have developed a system of self-assembled connections using actin filaments for 3-D microelectronic structures. Once the actin filaments become conductors, they join the various components of a system together. [TECHNICAL ARTICLE](#)

*Tags: Microelectronics, Biotechnology, S&T France*

## NEUROSCIENCE

### [Researchers Control Animals' Movements with Light](#)

[MIT Technology Review](#), 11FEB2013

A drug-like molecule has been found to let researchers control movements in mice and fish with flashes of light. Unlike similar experiments using a light-based technique known as optogenetics, the new method doesn't require researchers to genetically engineer animals in order to achieve the neural control. [TECHNICAL ARTICLE](#)

*Tags: Neuroscience*

### [Paralyzed man uses thoughts alone to control robot arm, touch friend's hand, after seven years](#)

[Science Daily](#), 09FEB2013

Researchers have described how an electrode array on top of the brain enabled a 30-year-old man to control the movement of a character on a computer screen in three dimensions with just his thoughts. It also enabled him to reach out with a robot arm to touch a friend's hand for the first time in the seven years since he was paralyzed.

[TECHNICAL ARTICLE](#)

*Tags: Neuroscience, Sensors*

## QUANTUM SCIENCE

### [Breakthrough with self-assembling quantum dots could bolster quantum photonics, solar cell efficiency](#)

[Nanowerk](#), 11FEB2013

Scientists from the U.S. Department of Energy 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*

### [Researchers explore quantum entanglement](#)

[Science Daily](#), 09FEB2013

According to a team of researchers from the US and Canada, different pairs of particles coming from the same source have slightly different positions and velocities. If you observe just one of the two particles from a pair, you can't be sure if a variation in its velocity, say, is due to the long-distance influence of its partner, or whether it is just a statistical fluctuation. In this way the peaceful coexistence of quantum physics and relativity is preserved. [TECHNICAL ARTICLE](#)

*Tags: Quantum science*

### [Scientists create 'building block' of quantum networks](#)

[Science Daily](#), 09FEB2013

A new device developed by researchers in the US, which combines a single nitrogen-vacancy centre in diamond with an optical resonator and an optical waveguide, could potentially become the memory or the processing element of such a network. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, Communications Technology*

**Calculating quantum vacuum forces in nanostructures**

Nanowerk, 08FEB2013

NIST researchers have solved the complicated problem of calculating the force between metal plates with complicated periodic nanoscale structures on their surfaces. The study will have broader applications for calculating other forces induced by fluctuations, including thermal emissions and near-field heat transfer. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, Government S&T, Nanomaterials*

**Physicists extract photons from diamond ring**

Physics World, 08FEB2013

Researchers in the US have made an integrated device that extracts photons from a tiny piece of diamond before the light is sent through a waveguide to the outside world. According to the researchers, the chip could be used to create quantum-information technology such as quantum repeaters. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, Breakthrough technology*

**SCIENCE WITHOUT BORDERS****Scientists create automated 'time machine' to reconstruct ancient languages**

UC Berkeley, 12FEB2013

UC Berkeley scientists have created an automated "time machine," of sorts, that will greatly accelerate and improve the process of reconstructing hundreds of ancestral languages.

*Tags: Science without borders, Communications Technology*

**In Mysterious Pattern, Math and Nature Converge**

Wired, 06FEB2013

Scientists now believe the widespread phenomenon, known as "universality," stems from an underlying connection to mathematics, and it is helping them to model complex systems from the internet to Earth's climate.

*Tags: Science without borders, Mathematics*

**SENSORS****A system that improves the precision of GPS in cities by 90 percent**

Alpha Galileo Foundation, 12FEB2013

Researcher in Spain have developed a prototype which incorporates a conventional GPS signal with those of other sensors (accelerometers and gyroscopes) in order to reduce the margin of error in establishing a location.

*Tags: Sensors*

**Building a biochemistry lab on a chip**

Science Daily, 12FEB2013

Using micro-fabrication techniques and incorporating a unique design of transistor-based heating, researchers at the University of Illinois at Urbana-Champaign are further advancing the use of silicon transistor and electronics in chemistry and biology for point-of-care diagnostics.

[TECHNICAL ARTICLE](#)

*Tags: Sensors*

**Explosive breakthrough in research on molecular recognition**

Science Daily, 12FEB2013

Researchers at the University of Alberta, Canada, found a method of using receptor-free nanomechanical infrared spectroscopy to increase recognition of chemical molecules in explosive mixtures. [TECHNICAL ARTICLE](#)

*Tags: Sensors, Explosives*

**First Test of Seismic Invisibility Cloak**

MIT Technology Review, 09FEB2013

A group from France says they've built and tested a seismic invisibility cloak in an alluvial basin in southern France. This is the first time such a device has been constructed.

[TECHNICAL ARTICLE](#)

*Tags: Sensors ■*

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