



# S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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## FEATURE ARTICLES

### [Nanomotors are controlled, for the first time, inside living cells](#)

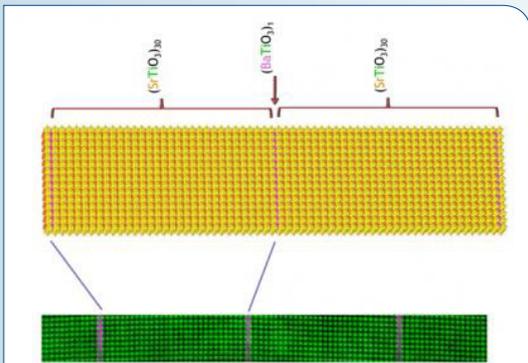
[Penn State Science, 10FEB2014](#)

Researchers at Penn State University have placed tiny synthetic motors inside live human cells, propelled them with ultrasonic waves and steered them magnetically. As these nanomotors move around and bump into structures inside the cells, the live cells show internal mechanical responses that no one has seen before. [TECHNICAL ARTICLE](#)

*Tags: Medical Sciences, Biology, Nanotechnology, Featured Article*

### [Crossover sound: Unambiguous evidence for coherent phonons in superlattices](#)

[Science Daily, 05FEB2014](#)



Electron microscopy-spectroscopy images of a strontium titanate/barium titanate superlattice film reveal the presence of atomically sharp interfaces with minimal intermixing. Superlattice is color-coded with strontium (orange) barium (purple) and titanium (green). Credit: Image courtesy of Berkeley Lab

The first “unambiguous demonstration” of the atomic-scale sound waves known as phonons crossing over from particle-like to wave-like behavior in superlattices was demonstrated

by researchers at the DOE’s Lawrence Berkeley National Laboratory. The research opens the door to improved thermoelectrics and possibly even phonon lasers.

[TECHNICAL ARTICLE](#)

*Tags: Materials science, Government S&T, Featured Article*

## S&T NEWS ARTICLES

### ADVANCED MANUFACTURING

#### [Flexible and semitransparent silicon electronics \(w/video\)](#)

[Nanowerk Spotlight, 11FEB2014](#)

Researchers in Saudi Arabia have developed a generic low-cost batch fabrication process based on standard microfabrication techniques to fabricate thin (>5 μm), mechanically flexible, optically semitransparent silicon fabric with pre- or post-released devices without any thermal budget limitation. [TECHNICAL ARTICLE](#)

*Tags: Advanced manufacturing, Flexible electronics*

#### [New live-cell printing technology works like ancient Chinese woodblock printing](#)

[Science Daily, 10FEB2014](#)

With a nod to 3rd century Chinese woodblock printing and children’s rubber stamp toys, an international team of researchers (USA, Taiwan) has developed a way to print living cells onto any surface, in virtually any shape. Unlike recent, similar work using inkjet printing approaches, almost all cells survive the process. [TECHNICAL ARTICLE](#)

*Tags: Advanced manufacturing, Biotechnology*

#### [China’s Huge 3D Printers, Soon Able to Print Automobile Sized Metal Objects](#)

[3D Printing Forum, 06FEB2014](#)

China is investing heavily in 3D printing, just like the U.S. and Europe. In June, China announced a gigantic 3D printer, which they claimed was the world’s largest at the time, with a 1.8 meter build diameter. Basically the thing could print out a nice sized bathroom vanity if you wanted it to.

*Tags: Advanced manufacturing, S&T China*

### ADVANCED MATERIALS

#### [How to make the wonder material graphene superconducting](#)

[Science Daily, 11FEB2014](#)

Researchers at the University of Vienna unveiled the superconducting pairing mechanism in Calcium doped

*continued...*

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graphene using the ARPES (Angle-resolved photoemission spectroscopy) method. Calcium is the most promising candidate to induce superconductivity in graphene with a critical temperature of about 1.5K. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Materials science*

### [Researchers 'design for failure' with model material](#)

[Technology Org](#), 10FEB2014

Researchers at the University of Pennsylvania have devised a method to study stress at the macro and micro scales at the same time. This method has allowed the researchers to demonstrate an unusual hybrid behavior in their model material: a reversible rearrangement of its particles that nevertheless has the characteristics of plastic deformation on the macroscale. Their study could pave the way for designing this potentially useful trait into new materials.

[TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Materials science*

### [Foresight Nanotechnology Integration Conference - Global Trends 2030](#)

[Next Big Future](#), 09FEB2014

The conference, sponsored by the Foresight Institute, brought together over 20 speakers to present their research and vision within the realm of groundbreaking atomic- and molecular-scale science and engineering with application across a wide range of advanced technologies, including materials, electronics, energy conversion, biotechnology and more.

*Tags: Advanced materials*

### [Large thermoelectric power from a combination of magnets and superconductors](#)

[Science Daily](#), 07FEB2014

Researchers in Finland have shown how a proper combination of magnetic metals and superconductors could make very strong thermoelectric conversion efficiency possible in metallic structures. The research could promote the conversion of waste heat into useful heat in industrial processes. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, S&T Finland*

### [Origami batteries for deformable electronics \(w/video\)](#)

[Nanowerk](#), 07FEB2014

Using the the origami design concept researchers at Arizona State University were able to achieve significant system-level linear and areal deformability for their battery (over 1,000%), large twistability and bendability, and up to 74% areal coverage. They describe a technique for locking an origami structure using phase change materials.

[TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Battery, Energy*

### [Theorists predict new forms of exotic insulating materials: Six new types?](#)

[Science Daily](#), 06FEB2014

Researchers at MIT have performed a more detailed analysis that hints at the existence of six new kinds of topological insulators. The analysis provides details on predicted properties that should allow experimentalists to begin to understand the behavior of these exotic states of matter. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials*

## AUTONOMOUS SYSTEMS & ROBOTICS

### [Video Friday: Death Defying Vacuums, Tate After Dark, and Taranis Takes Flight](#)

[IEEE Spectrum](#), 07FEB2014

Big news this week from BAE Systems, as their Taranis drone made its first test flight. The goal here is to develop an unmanned plane that can fly into "contested airspace" and deliver its weapons deep behind enemy lines.

*Tags: Autonomous systems & robotics*

### [World-first breakthrough for small unmanned aircraft](#)

[PhysOrg.com](#), 06FEB2014

Researchers in Australia have developed an on board system that has enabled a UA to detect another aircraft using vision while in flight. During the flight, the onboard system provided real time warnings back to the ground control station resulting in a successful manual collision avoidance manoeuvre—a critical point for allowing UAs to fly in commercial airspace. The flight trial was carried out in unsegregated, class G airspace.

*Tags: Autonomous systems & robotics, S&T Australia, Sensors*

## BIOTECHNOLOGY

### [World's First Entanglement-Enhanced Microscope](#)

[MIT Technology Review](#), 10FEB2014

The microscope developed by researchers in Japan produces images with entangled photons that are significantly sharper than those possible with ordinary light alone. That should be useful in a number of different applications; for instance, when samples might be damaged by intense light. [TECHNICAL ARTICLE](#)

*Tags: Biotechnology, S&T Japan*

## ENERGY

### [Nonflammable lithium ion battery developed](#)

[Science Daily](#), 10FEB2014

In studying a material that prevents marine life from sticking to the bottom of ships, researchers at the University of North Carolina at Chapel Hill have identified a surprising replacement for the only inherently

“Science is a self-correcting process. To be accepted, new ideas must survive the most rigorous standards of evidence and scrutiny.” CARL SAGAN

flammable component of today's lithium-ion batteries: the electrolyte. The discovery paves the way for developing a new generation lithium-ion battery that doesn't spontaneously combust at high temperatures. [TECHNICAL ARTICLE](#)

*Tags: Energy, Battery*

### [Researchers develop world's first microwave-controlled ultra compact power converter](#)

[PhysOrg.com](#), 10FEB2014

Researchers at Panasonic Corporation have developed an all-integrated power converter which consists of an integrated matrix-converter power switching chip that directly converts AC power to AC of the desired frequency and amplitude. A gate drive transmitter chip controls the power switching chip. The new converter, which is one-hundredth of the size of conventional power converters, reduces conversion power loss.

*Tags: Energy*

### [Could Volcanoes Power the World?](#)

[Science Magazine](#), 07FEB2014

Researchers have been able to tap into even greater energy by drilling into volcanoes and exploiting the heat of molten rock. If current geothermal wells are replaced with the new technology, it could provide 30% more power than current renewable energy sources.

*Tags: Energy*

### [Why the Promise of Cheap Fuel from Super Bugs Fell Short](#)

[MIT Technology Review](#), 05FEB2014

New techniques are needed to speed up the process of engineering fuel-producing organisms. If engineers could isolate desired genetic traits quickly and predict how a combination of metabolic pathway changes would affect a microorganism, then designing cells would be much faster.

*Tags: Energy*

## FORECASTING

### [UI researchers evaluate best weather forecasting models](#)

[e! Science News](#), 07FEB2014

University of Iowa researchers recently tested the ability of the world's most advanced weather forecasting models to predict the Sept. 9-16, 2013 extreme rainfall that caused severe flooding in Boulder, Colo. They concluded that overall, these models tended to underestimate rainfall amounts and placed the rainfall in the wrong area, even though they provided an indication that a period of heavy rainfall was going to affect parts of Colorado. [TECHNICAL ARTICLE](#)

*Tags: Forecasting, Climatology*

## MATERIALS SCIENCE

### [Slowing Heat without Obstructions](#)

[American Physical Society Spotlight](#), 07FEB2014

In computer simulations, researchers at the University of Colorado, Boulder, show that heat flow along a thin film of silicon can be drastically reduced by erecting nanoscale pillars on top of it. Atomic vibrations in the pillars end up slowing the main flow through the film. The team says that the pillars should reduce heat transport without impeding the flow of electric current—a combination that is critical to thermoelectric devices. [TECHNICAL ARTICLE](#)

*Tags: Materials science*

### [Molecular traffic jam makes water move faster through nanochannels](#)

[Science Daily](#), 06FEB2014

Northwestern University researchers have shown that water molecules traveling through tiny carbon nanotube pipes flow intermittently enabling surprisingly high flow rates of 10 billion molecules per second or more. The discovery could enable applications such as chemical separations, carbon nanotube-powered batteries, and the fabrication of quantum dots, nanocrystals. [TECHNICAL ARTICLE](#)

*Tags: Materials science*

### [Ballistic transport in graphene suggests new type of electronic device](#)

[Science Daily](#), 05FEB2014

Researchers at the Georgia Institute of Technology report that using electrons more like photons could provide the foundation for a new type of electronic device that would capitalize on the ability of graphene to carry electrons with almost no resistance even at room temperature—a property known as ballistic transport. [TECHNICAL ARTICLE](#)

*Tags: Materials science*

## MICROELECTRONICS

### [Mechanical engineer investigates passive cooling system for microelectronics](#)

[PhysOrg.com](#), 11FEB2014

Researchers at South Dakota State University are investigating tiny flexible pipes, called pulsating or oscillating heat pipes, that can cool a device while using a minimum amount of power. It can move a lot of heat without a power input and is cheaper to manufacture than traditional heat pipes.

*Tags: Microelectronics*

*continued...*

## [MITRE-Harvard nanocomputer may point the way to future computer miniaturization](#)

KurzweilAI, 06FEB2014

An interdisciplinary team of scientists and engineers from the MITRE Corporation and Harvard University have taken key steps toward ultra-small electronic computer systems that push beyond the imminent end of Moore's Law. They designed and assembled, from the bottom up, a functioning, ultra-tiny control computer (nanoccontroller) that they say is the densest nanoelectronic system ever built.

Tags: *Microelectronics*

## FEATURED RESOURCE

### [Defense Update](#)

Highlights worldwide defense programs, asymmetric, hybrid warfare, and net centric operations. Provides a comprehensive list of professional events and exhibitions. [RSS](#)

## NEUROSCIENCE

### [Stress gives cells a 'second childhood'](#)

RIKEN Research, 10FEB2014

A team of researchers from the USA and Japan suggest that exposing mouse cells to acidic stress can make them regress to an extremely developmentally immature state, transcending even that of embryonic stem (ES) cells. These findings open up, not only in areas like regenerative medicine, but perhaps in the study of cellular senescence and cancer. [TECHNICAL ARTICLE 1, 2](#)

Tags: *Neuroscience, S&T Japan*

### [Growing brains in the lab](#)

RIKEN Research, 07FEB2014

Researchers in Japan have shown that human embryonic stem (ES) cells can spontaneously organize into the cerebral cortical tissue that forms at the front, or 'brain' end, of the developing neural tube. According to the researchers, efficient generation of cortical tissues could provide a valuable resource of functional neurons and tissues for medical applications. By combining this method with disease-specific human induced pluripotent stem cells, it will also be possible to reproduce complex human disorders. [TECHNICAL ARTICLE](#)

Tags: *Neuroscience, Medical technology, S&T Japan*

### [Brain asymmetry improves processing of sensory information, study shows](#)

Science Daily, 06FEB2014

An international team of researchers (UK, Belgium, Germany) has shown that, in zebrafish at least, loss of brain asymmetry can have significant consequences on

sensory processing, raising the possibility that defects in the development of brain functions on either the left or right side could cause cognitive dysfunction. [TECHNICAL ARTICLE](#)

Tags: *Neuroscience*

### [Your memory is no video camera: It edits the past with present experiences](#)

Science Daily, 04FEB2014

According to a study by researchers at Northwestern University memory rewrites the past with current information, updating your recollections with new experiences to aid survival. The study shows the exact point in time when that incorrectly recalled information gets implanted into an existing memory. [TECHNICAL ARTICLE](#)

Tags: *Neuroscience*

### [Blue light may fight fatigue around the clock](#)

Medical Express, 03FEB2014

Researchers from Brigham and Women's Hospital, in Boston, have found that exposure to short wavelength, or blue light, during the biological day directly and immediately improves alertness and performance.

Tags: *Neuroscience*

## QUANTUM SCIENCE

### [A Quantum Machine Made of Ions](#)

American Physical Society Spotlight, 06FEB2014

Researchers at the University of Michigan proposed a boson sampling machine which consists of a line of trapped ions, spaced roughly 10 micrometers apart. The "input" bosons are the quantized vibrations (phonons) in the ion string, which could be initialized by a laser; the "output" is the phonons' final states, which shift the atoms' internal energy levels and could therefore be read out with another laser. The authors argue that, using existing ion trap technology, their machine could handle 20 to 30 bosons. [TECHNICAL ARTICLE](#)

Tags: *Quantum science*

### [Scientists use 'voting' and 'penalties' to overcome errors in quantum optimization](#)

Science Daily, 06FEB2014

Seeking a solution to decoherence, researchers in Southern California, have developed a strategy of linking quantum bits together into voting blocks that significantly boosts their accuracy. In a new study, the team found that their method results in at least a five-fold increase in the probability of reaching the correct answer when the processor solves large problems involving hundreds of qubits. [TECHNICAL ARTICLE](#)

Tags: *Quantum science*

## S&amp;T POLICY

**China opens fourth Antarctic research station**  
PhysOrg.com, 10FEB2014

The station sits at an altitude of 2,600 metres (8,530 feet) between China's Zhongshan and Kunlun stations, according to the State Oceanic Administration. The site's average annual temperature is minus 36.6 degrees Celsius (minus 33 degrees Fahrenheit) and construction began on December 28. Pictures of the Taishan facility released by Xinhua show a 12-sided structure raised on stilts above the ice.

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

**US lead in science and technology shrinking**  
NSF News, 06FEB2014

According to a report released by the National Science Board the United States' predominance in science and technology eroded further during the last decade. Several Asian nations--particularly China and South Korea—rapidly increased their innovation capacities. Science and Engineering Indicators 2014

*Tags: S&T policy*

**Secretary Vilsack Announces Regional Hubs to Help Agriculture, Forestry Mitigate the Impacts of a Changing Climate**

USDA News, 05FEB2014

USDA's Climate Hubs are part of our broad commitment to developing the next generation of climate solutions, so that our agricultural leaders have the modern technologies and tools they need to adapt and succeed in the face of a changing climate.

*Tags: S&T policy, Climatology*

## SCIENCE WITHOUT BORDERS

**Is social networking making us stupid?**  
PhysOrg.com, 06FEB2014

An international team of researchers (USA, UK, France, UAE) found that in the internet era, where we have access to a diversity of information, many pundits say humankind will learn to make more informed decisions. Whereas others suggest having so much information at our fingertips will limit our ability for concentration, contemplation and reflection. The study concluded that whilst mass connectivity through social media and the internet makes us look smarter it might be making us stupider. TECHNICAL ARTICLE

*Tags: Science without borders*

## SENSORS

**Electronic whiskers could help robots navigate**  
Physics World, 10FEB2014

Researchers at the University of California, Berkeley, have made highly sensitive, lightweight "electronic whiskers" that can detect the lightest of touches or a gentle breeze. Made from a mixture of carbon nanotubes and silver nanoparticles, the whiskers could be used to create "skin" for robots and in interfaces between humans and machines. TECHNICAL ARTICLE

*Tags: Sensors, Autonomous Systems & Robotics*

**Vanadium dioxide research opens door to new, multifunctional spintronic smart sensors**  
Science Daily, 05FEB2014

Researchers at North Carolina State University open the door to smarter sensors by integrating vanadium dioxide onto a silicon chip and using lasers to make the material magnetic. The advance paves the way for multifunctional spintronic smart sensors for use in military applications and next-generation spintronic devices. TECHNICAL ARTICLE

*Tags: Sensors, Materials science ■*

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