



# S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

[Advanced manufacturing \(2\)](#)

[Environmental science \(4\)](#)

[Neuroscience \(1\)](#)

[Science without borders \(1\)](#)

[Communications technology \(3\)](#)

[Forecasting \(1\)](#)

[Photonics \(1\)](#)

[Sensors \(3\)](#)

[Energy \(4\)](#)

[Materials science \(10\)](#)

[Quantum science \(5\)](#)

## FEATURE ARTICLES

### [Time warp: Researchers show possibility of cloning quantum information from the past](#)

[PhysOrg.com, 12DEC2013](#)

LSU researchers have shown that it would be theoretically possible for time travelers to copy quantum data from the past. This would turn quantum theory into an effectively classical theory in which, for example, classical data thought to be secured by quantum cryptography would no longer be safe.

[TECHNICAL ARTICLE](#)

*Tags: Quantum science, Featured Article*

### [Viruses Build Piezoelectric Nanogenerator Through Self Assembly](#)

[IEEE Spectrum, 06DEC2013](#)

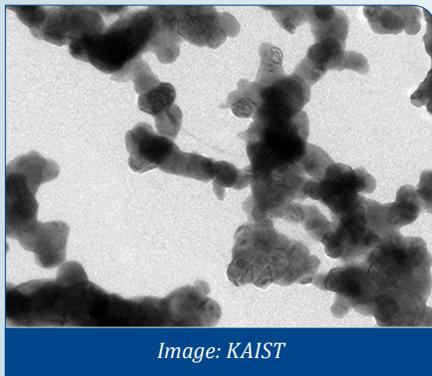


Image: KAIST

Researchers in South Korea demonstrated that they could build a high-performance, flexible nanogenerator from the piezoelectric material using the M13 viral gene as a template

for guiding self-assembly of the device. [TECHNICAL ARTICLE](#)

*Tags: Advanced manufacturing, Biomimetics, Featured Article*

### [Laser Light at Useful Wavelengths from Semiconductor Nanowires](#)

[Science Daily, 05DEC2013](#)

Researchers in Germany have demonstrated that nanowire lasers emit light in the near-infrared, approaching the “sweet spot” for fiber-optic

communications. They can be grown directly on silicon, presenting opportunities for integrated photonics and optoelectronics. And they operate at room temperature, a prerequisite for real-world applications. [TECHNICAL ARTICLE 1, 2, 3](#)

*Tags: Photonics, Breakthrough technology, S&T Germany, Featured Article*

## S&T NEWS ARTICLES

### ADVANCED MANUFACTURING

#### [A Virtual Factory You Can Feel](#)

[Science Daily, 06DEC2013](#)

Researchers in Germany have constructed a miniature factory—including a small robot that moves barrels. They observed the miniature factory with a camera. With ten images per second it is constantly recording the status in the real world and transmitting these data into the virtual.

*Tags: Advanced manufacturing, S&T Germany*

### COMMUNICATIONS TECHNOLOGY

#### [The Emerging Technologies Shaping Future 5G Networks](#)

[MIT Technology Review, 09DEC2013](#)

Researchers at Alcatel-Lucent’s Bell Labs speculate that disruptive technology will change the idea that radio networks must be made up of “cells” centered on a base station. An increasingly likely possibility is that 5G networks will rely on a number of different frequency bands that carry information at different rates and have wildly different propagation characteristics. [TECHNICAL ARTICLE](#)

*Tags: Communications Technology*

#### [Human-Computer Interface Technologies Follow Consumers’ Actions, Offer Help](#)

[Science Daily, 04DEC2013](#)

The pan-European SMARCOS (Smart Composite Human-Computer Interfaces) initiative is focused on developing technology based on internet sharing between devices,

*continued...*

[BACK TO TOP](#)

which allows the interfaces and attributes of various digital devices to work seamlessly together in smart ecosystems. It makes use of information on the actions and processes of several people in a single situation to guide the operation and functions of device interfaces.

*Tags: Communications Technology, S&T EU*

### **Ten Times More Throughput On Optic Fibers**

EPFL (Switzerland), 04DEC2013

Researchers in Switzerland have come up with a method for fitting pulses together within the fibers, thereby reducing the space between pulses. Their approach makes it possible to use all the capacity in an optical fiber. This opens the door to a ten-fold increase in throughput in our telecommunications systems. [TECHNICAL ARTICLE](#)

*Tags: Communications Technology, S&T Switzerland*

## ENERGY

### **Harvesting Electricity: Triboelectric Generators Capture Wasted Power**

Science Daily, 09DEC2013

Researchers at Georgia Institute of Technology are using what's technically known as the triboelectric effect to create surprising amounts of electric power by rubbing or touching two different materials together. They believe the discovery can provide a new way to power mobile devices such as sensors and smartphones by capturing the otherwise wasted mechanical energy from such sources as walking, wind, vibration, ocean waves or even moving cars.

*Tags: Energy*

### **The Sad Story of the Battery Breakthrough that Proved Too Good to Be True**

MIT Technology Review, 06DEC2013

It was previously reported that a startup, Envia Systems, claimed its batteries could store twice as much as conventional ones—and could cut costs in half. But according to court documents Envia hasn't been able to reproduce its stunning results.

*Tags: Energy*

### **Increasing solar cell efficiency limit by 'heating up' 'cold' photons**

Nanowerk Spotlight, 05DEC2013

Researchers at MIT have shown that solar-to-electricity conversion efficiency higher than the fundamental S-Q limit can be achieved in a hybrid platform that combines a single-junction solar cell and a thermal up-converter. [TECHNICAL ARTICLE](#)

*Tags: Energy, Solar energy*

### **Researchers present a new method of wirelessly recharging medical device batteries with ultrasound**

PhysOrg.com, 04DEC2013

To keep our bionic body parts from powering down, a

group of Arizona researchers is developing a safe, noninvasive, and efficient means of wireless power transmission through body tissue.

*Tags: Energy, Biotechnology*

## ENVIRONMENTAL SCIENCE

### **Scientists Probe Abandoned Mine for Clues About Permanent Carbon Dioxide Sequestration**

Science Daily, 08DEC2013

An abandoned mine near Stanford University contains some of the world's largest veins of pure magnesium carbonate, a chalky mineral made of carbon dioxide (CO<sub>2</sub>) and magnesium. How the magnesite veins formed millions of years ago has long been a puzzle. The solution proposed by researchers at Stanford University could lead to a novel technique for converting CO<sub>2</sub>, a potent greenhouse gas, into solid magnesite.

*Tags: Environmental science*

### **Deep-Sea Study Reveals Cause of 2011 Tsunami: Unusually Thin, Slippery Geological Fault Found**

Science Daily, 05DEC2013

A study by an international team of researchers (USA, Canada, Japan, New Zealand, Italy, India) reveals several factors that help account for this unexpectedly violent slip between the two tectonic plates. The scientists also discovered that the clay deposits that fill the narrow fault are made of extremely fine sediment. The discovery suggests that other subduction zones in the northwest Pacific, where this type of clay is present, may be capable of generating similar, huge earthquakes. [TECHNICAL ARTICLE 1, 2, 3](#)

*Tags: Environmental science*

### **Geoengineering Approaches to Reduce Climate Change Unlikely to Succeed**

Science Daily, 05DEC2013

Researchers in Germany used a simple energy balance analysis to explain how Earth's water cycle responds differently to heating by sunlight than it does to warming due to a stronger atmospheric greenhouse effect. Further, they show that this difference implies that reflecting sunlight to reduce temperatures may have unwanted effects on Earth's rainfall patterns. [TECHNICAL ARTICLE](#)

*Tags: Environmental science, Climatology*

### **New Report Calls for Attention to Abrupt Impacts From Climate Change, Emphasizes Need for Early Warning System**

National Academy of Sciences, 03DEC2013

According to a new report from the National Research Council, even steady, gradual change in the physical climate system can have abrupt impacts elsewhere in

*continued...*

“If we knew what it was we were doing, it would not be called research, would it?”

ALBERT EINSTEIN

human infrastructure and ecosystems if critical thresholds are crossed. The report calls for the development of an early warning system that could help society better anticipate sudden changes and emerging impacts. [REPORT](#)

*Tags: Environmental science, Climatology*

## FORECASTING

### [First Real-Time Flu Forecast Successful](#)

[Science Daily, 03DEC2013](#)

Researchers at Columbia University report the first large-scale demonstration of the flu forecasting system. It adapts techniques used in modern weather prediction to turn real-time, web-based estimates of influenza infection into local forecasts of the seasonal peak by locality. [TECHNICAL ARTICLE](#)

*Tags: Forecasting*

## MATERIALS SCIENCE

### [Morphing Material Has Mighty Potential](#)

[Science Daily, 09DEC2013](#)

Rice University researchers found that layers of polystyrene and liquid crystal elastomer (LCE) react to heat in a predictable and repeatable way, allowing for configurations to be designed into the material depending on a number of parameters. Materials that can change their shape based on environmental conditions are useful for optics, three-dimensional biological scaffolds and the controlled encapsulation and release of drugs. [TECHNICAL ARTICLE](#)

*Tags: Materials science*

### [Pioneering Path to Electrical Conductivity in ‘Tinker Toy’ Material \(MOF\)](#)

[Science Daily, 09DEC2013](#)

Researchers at DOE’s Sandia National Laboratory have a technique that successfully increases the electrical conductivity of MOF by over six orders of magnitude. Applications for electrically conducting MOFs include chemical sensing, medical diagnostics, energy harvesting and storage, and microelectronics. [TECHNICAL ARTICLE](#)

*Tags: Materials science, Government S&T*

### [Polymers Can Behave Like Insulators, Semiconductors and Metals—As Well as Semimetals](#)

[Science Daily, 09DEC2013](#)

An international team of researchers (Sweden, Australia, Belgium, Norway, Denmark) report that they measured the thermoelectric properties of various poly (3, 4-ethylenedioxythiophene) samples, and observe a marked increase in the Seebeck coefficient when the electrical conductivity

is enhanced through molecular organization. The high Seebeck value, the metallic conductivity at room temperature and the absence of unpaired electron spins make polymer semi-metals attractive for thermoelectrics and spintronics. [TECHNICAL ARTICLE](#)

*Tags: Materials science*

### [Scientists Scale Terahertz Peaks in Nanotubes](#)

[Science Daily, 09DEC2013](#)

Researchers at Rice University have shown that contrary to previous theories, the dominant terahertz response comes from narrow-gap semiconducting nanotubes only if they’re metallic by nature or doped. This opens up the possibility that the tubes can be used in a wide array of optoelectronic amplifiers, detectors, polarizers and antennas. [TECHNICAL ARTICLE](#)

*Tags: Materials science, Terahertz technology*

### [Electrical control of single atom magnets](#)

[Nanowerk, 08DEC2013](#)

An international team of researchers (UK, Germany, Spain) report that the energy needed to change the magnetic orientation of a single atom—which determines its magnetic stability and therefore its usefulness in a variety of future device applications—can be modified by varying the atom’s electrical coupling to nearby metal. The results support efforts to find material systems with large magnetic anisotropy that are free of rare earth elements. [TECHNICAL ARTICLE](#)

*Tags: Materials science, S&T Germany, S&T UK*

### [Scientists Discover Quick Recipe for Producing Hydrogen](#)

[Science Daily, 08DEC2013](#)

Researchers in France have developed a method to produce hydrogen: In a microscopic high-pressure cooker called a diamond anvil cell combine ingredients: aluminum oxide, water, and the mineral olivine. Set at 200 to 300 degrees Celsius and 2 kilobars pressure—comparable to conditions found at twice the depth of the deepest ocean. Cook for 24 hours. [TECHNICAL ARTICLE](#)

*Tags: Materials science, S&T France*

### [New superconductor theory may revolutionize electrical engineering](#)

[PhysOrg.com, 06DEC2013](#)

Researchers from Brookhaven Laboratory, Lawrence Berkeley Laboratory, UC Berkeley and Cornell University propose that odd behaviors of superconductors—and superconductivity itself—can all be traced to a single starting point, and they explain why there are so many

*continued...*

variations. This theory might be a step toward new, higher-temperature superconductors that would revolutionize electrical engineering with more efficient motors and generators and lossless power transmission.

*Tags: Materials science*

### **Quantum Effects Help Cells Capture Light, but the Details Are Obscure**

[Science Daily](#), 06DEC2013

Researchers in Canada and the Netherlands write that understanding how coherence on short length and time scales might seed some kind of property or function in light-gathering systems. This might help develop environmentally friendly solar technologies that could regulate their rate of energy input and redistribute and repair their components when the need arises, as living cells do. [TECHNICAL ARTICLE](#)

*Tags: Materials science, S&T Canada*

### **Snapshots Differentiate Molecules from Their Mirror Image**

[Science Daily](#), 28NOV2013

An international team of researchers (Germany, Israel, USA) have developed a method, which takes a snapshot of chiral molecules and so reveals their spatial atomic structure. The molecule's handedness, or chirality, can be directly derived from this information. [TECHNICAL ARTICLE](#)

*Tags: Materials science*

### **Better Combustion Through Plasma**

[Science Daily](#), 26NOV2013

Researchers at Ohio State University found that plasma-assisted combustion can be sustained even in conditions such as low air pressure, high wind, or low fuel. This technology could help military jets fly at high altitudes and passenger planes and unmanned drones cruise for long distances while conserving fuel.

*Tags: Materials science*

## FEATURED RESOURCE

### **Government Databases in Science & Technology**

The only databases included are those which are considered substantial research sources; almost all have some kind of search capability unless otherwise noted.

## NEUROSCIENCE

### **Surprising Discovery: Skin Communicates With Liver**

[Science Daily](#), 06DEC2013

Researchers from Denmark have discovered that the skin is capable of communicating with the liver. They say that it may help our understanding of how skin diseases can affect the rest of the body. [TECHNICAL ARTICLE](#)

*Tags: Neuroscience*

## QUANTUM SCIENCE

### **Entanglement strengthened by losing information**

[Physics World](#), 06DEC2013

An entangled state of two quantum bits can be created and stabilized using interactions that are normally thought to be detrimental, according to two international groups of researchers (USA, Denmark and USA, France). While the two groups studied two different physical systems, they have both shown that an entangled quantum system can be produced and maintained by coupling it to an environment that dissipates energy. [TECHNICAL ARTICLE 1, 2](#)

*Tags: Quantum science*

### **Quantum dots with confined light holes could have applications in quantum technologies**

[PhysOrg.com](#), 06DEC2013

An international team of researchers (Germany, the Netherlands, Austria) have created a quantum dot that contains an exciton in the form of an electron bound to a light hole. The use of a light hole could enable the quantum dots to have specific advantages for quantum information technologies. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, Communications Technology*

### **Researchers Create Nonlinear Light-Generating Zero-Index Metamaterial**

[Science Daily](#), 05DEC2013

Researchers at DOE's Lawrence Berkeley National Laboratory have shown that in their demonstration of nonlinear dynamics in an optical metamaterial with zero-index refraction, equal amounts of nonlinearly generated waves are observed in both forward and backward propagation directions. The removal of phase matching in nonlinear optical metamaterials may lead to applications such as efficient multidirectional light emissions for novel light sources and the generation of entangled photons for quantum networking. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, Government S&T*

### **Viewpoint: Sharing Entanglement without Sending It**

[arXiv.org](#), 04DEC2013

In three new experiments, researchers in Germany demonstrate how entanglement can be shared between distant parties without the need of an entangled carrier.

*Tags: Quantum science, S&T Germany*

## SCIENCE WITHOUT BORDERS

### **You Can't Get Entangled Without a Wormhole: Physicist Finds Entanglement Instantly Gives Rise to a Wormhole**

[Science Daily](#), 05DEC2013

Researchers at MIT have found that, looked at through the lens of string theory, the creation of two entangled

*continued...*

[BACK TO TOP](#)

quarks—the building blocks of matter—simultaneously gives rise to a wormhole connecting the pair. The theoretical results bolster the relatively new and exciting idea that the laws of gravity holding together the universe may not be fundamental, but arise from something else: quantum entanglement. [TECHNICAL ARTICLE](#)

*Tags: Science without borders*

## SENSORS

### [World's Highest Quantum Efficiency UV Photodetectors Created](#)

[Science Daily, 09DEC2013](#)

Researchers at Northwestern University found that by growing this  $\text{Al}_x\text{Ga}_{1-x}\text{N}$ -based solar-blind photodetector structures at less than 50 millibar pressure helps to suppress parasitic pre-reactions and yields more manageable growth rates while still maintaining good material quality. By refining the low-pressure metal-organic chemical-vapor-deposition growth as well as the UV photodetector p-i-n structure, they have successfully fabricated the world's highest quantum efficiency solar-blind UV photodetectors grown on sapphire substrate.

[TECHNICAL ARTICLE](#)

*Tags: Sensors*

### [Radio Pulse Gun Aims to Stop Modern Cars](#)

[IEEE Spectrum, 05DEC2013](#)

A British company called E2V is marketing the radio pulse gun as a non-lethal weapon for law enforcement and military customers, but the device is far from perfect: it won't do much to stop older vehicles—and it might even prove dangerous for the newest drive-by-wire cars.

*Tags: Sensors*

### [Inexpensive 'Nano-Camera' Can Operate at the Speed of Light](#)

[Science Daily, 26NOV2013](#)

Researchers at MIT created a 3D nano-camera, which uses an encoding technique commonly used in the telecommunications industry to calculate the distance a signal has travelled. The device could be used in medical imaging and collision-avoidance detectors for cars, and to improve the accuracy of motion tracking and gesture-recognition devices used in interactive gaming.

*Tags: Sensors, Imaging Technology* ■

## ABOUT THIS PUBLICATION

The appearance of external hyperlinks in this publication does not constitute endorsement by the United States Department of Defense (DoD) of the linked web sites, nor the information, products or services contained therein. In addition, the content featured does not necessarily reflect DoD's views or priorities.

To subscribe (or unsubscribe), visit <https://tin-ly.sainc.com/ASDRE>. To provide feedback or ask questions, contact us at [asdre-st-bulletin-reply@sainc.com](mailto:asdre-st-bulletin-reply@sainc.com).

This publication is authored and distributed by:

**Dr. Brian Beachkofski**  
Director, Office of  
Technical Intelligence (OTI)

**Ms. Hema Viswanath**  
OTI Corporate Librarian