



# S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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## FEATURE ARTICLES

### [In pictures: Science news highlights of 2013](#)

[BBC News, 25DEC2013](#)



File photo provided by Chelyabinsk.ru

The shock wave from an asteroid that burned up over Russia in February was so powerful that it trav-

elled twice around the globe, scientists say. More than 1,000 people were injured when a 17m, 10,000-tonne space rock burned up above Chelyabinsk.

*Tags: Science without borders, Featured Article*

### [10 Breakthrough Technologies 2013](#)

[MIT Technology Review, 24DEC2013](#)

We're looking for technologies that we believe will expand the scope of human possibilities.

*Tags: Science without borders, Featured Article*

### [Best of 2013: Government Lab Reveals It Has Operated Quantum Internet for Over Two Years](#)

[MIT Technology Review, 23DEC2013](#)

In May, the blog revealed that for more than two years, Los Alamos National Laboratory has been running an alternative quantum internet for two and half years. Their approach is to create a quantum network based around a hub and spoke-type network. All messages get routed from any point in the network to another via this central hub.

*Tags: Communications Technology, Government S&T, Quantum science, Featured Article*

## S&T NEWS ARTICLES

### ADVANCED MANUFACTURING

#### [How to Brew Your Own Conductive Ink](#)

[IEEE Spectrum, 25DEC2013](#)

The new ink can be used in an ordinary roller-ball pen to draw circuit traces. The recipe for making the ink is amazingly straightforward: Mix 75.5 parts gallium with 24.5 parts indium in a beaker of deionized water, heat to 50 °C, stir, and voilà: an alloy that's liquid at room temperature, costs about US \$1 per milliliter, and is two orders of magnitude more conductive than the nanoparticle inks; its resistivity is just 17 times that of copper.

*Tags: Advanced manufacturing*

#### [It Works! A Tiny Speaker Printed on a Single Sheet of Paper](#)

[Wired, 20DEC2013](#)

A France-based product designer has created a series of paper electronics—an amplifier, speaker and radio—stripped down to their most basic components and fitted onto a single sheet of paper. The idea was that the sheet of paper become the object, with no complicated assembly needed.

*Tags: Advanced manufacturing*

### ADVANCED MATERIALS

#### [A New Use for Coal: Glowing Nanodots](#)

[MIT Technology Review, 25DEC2013](#)

According to researchers at Rice University the new method could represent a very cheap way to produce fluorescent carbon nanoparticles that could be useful in biomedicine, and especially in the imaging of living human cells and tissues. They are working on developing the particles into fluorescent probes and drug-delivery vehicles. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials*

*continued...*

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## AUTONOMOUS SYSTEMS &amp; ROBOTICS

**[Video Friday: The Year in Robots](#)**[IEEE Spectrum, 27DEC2013](#)

DARPA needed a strong and capable robot for its Robotics Challenge, so it turned to Boston Dynamics. Building on existing platforms like PETMAN, Boston Dynamics created ATLAS, a massive, hydraulically powered humanoid rugged enough to take part in DARPA's disaster scenarios.

*Tags: Autonomous systems & robotics*

**[After Impressive Demonstrations of Robot Skill, DARPA Robotics Challenge Trials Conclude](#)**[DARPA News, 26DEC2013](#)

After two days of competition, DARPA selected eight teams to receive up to \$1 million in funding to continue their work. With the conclusion of the DRC Trials, DARPA and the teams are now looking ahead to the DRC Finals sometime in the next 12-18 months.

*Tags: Autonomous systems & robotics, Government S&T*

**[Zurich team develops walking, jumping, balancing, Cubli \(w/video\)](#)**[Technology Org, 23DEC2013](#)

Researchers in Switzerland have developed Cubli, which is a 15 × 15 × 15 cm cube that can jump up and balance on its corner. Reaction wheels mounted on three faces of the cube rotate at high angular velocities and then brake suddenly, causing the Cubli to jump up. Applications include planetary exploration and self-assembling robots.

*Tags: Autonomous systems & robotics, S&T Switzerland*

## BIOTECHNOLOGY

**[Epigenetics enigma resolved](#)**[Nanowerk, 26DEC2013](#)

Researchers at Emory University determined the structure of a Tet family member by X-ray crystallography. The structure shows how the enzyme interacts with its target DNA, bending the double helix and flipping out the base that is to be modified. [TECHNICAL ARTICLE](#)

*Tags: Biotechnology, Biology*

## COMMUNICATIONS TECHNOLOGY

**[New approach to vertex connectivity could maximize networks' bandwidth](#)**[MIT Technology Review, 24DEC2013](#)

Researchers at MIT have a new approach to understanding "vertex connectivity," which could ultimately lead to communications protocols that coax as much bandwidth as possible from networks.

*Tags: Communications Technology*

**[A Breakthrough for Speeding Satellite Feeds](#)**[MIT Technology Review, 23DEC2013](#)

When regular TCP is used on wireless networks, some bandwidth gets wasted. The tweaked version of TCP being honed by the MIT group and colleagues instead sends mathematical functions describing multiple packets so that a receiving device, such as a satellite terminal, can solve for missing ones without having to re-fetch them.

[TECHNICAL ARTICLE](#)

*Tags: Communications Technology, Satellite technology*

**[The analogue of a tsunami for telecommunication](#)**[Technology Org, 23DEC2013](#)

Previously, researchers in Russia demonstrated that the primary source of noise in microresonator based optical frequency combs is related to non-linear harmonic generation mechanisms. Their recent study contains at least three important results: a technique to generate stable femtosecond pulses, optical combs, and microwave signals.

[TECHNICAL ARTICLE](#)

*Tags: Communications Technology, S&T Russia*

## ENERGY

**[Team creates a low cost thin film photovoltaic device with high energy efficiency](#)**[PhysOrg.com, 26DEC2013](#)

The solar cell developed by an international team of researchers (Spain, Switzerland) consists of a thin perovskite film sandwiched between two very thin organic semiconductors. It is also possible to make the device semitransparent which allows their integration with building facades since they are very thin and light weight.

[TECHNICAL ARTICLE](#)

*Tags: Energy, Solar energy*

**[Scientists build ion-selective membrane for ultra-stable lithium sulfur batteries](#)**[PhysOrg.com, 24DEC2013](#)

Researchers in China have developed a new strategy to build ultra-stable lithium-sulfur batteries based on an ion selective membrane system. With this new membrane system, the cyclic degradation of the cell was significantly reduced to 0.08% per cycle within the first 500 cycles.

[TECHNICAL ARTICLE](#)

*Tags: Energy, S&T China*

“All of physics is either impossible or trivial. It is impossible until you understand it, and then it becomes trivial.” ERNEST RUTHERFORD

## ENVIRONMENTAL SCIENCE

### [ScienceShot: Earth's Orbit Reshapes Sea Floor](#) Science Magazine, 24DEC2013

Researchers at Harvard University have shown in a computer model that orbital variations should vary the amount of mantle rock that melts kilometers beneath midocean ridges. That, in turn, would vary the amount of ocean crust that solidifies from the melted rock, changing the thickness of new crust by as much as a kilometer as it slides down either side of a midocean ridge.

Tags: Environmental science

### [Solar Activity Not a Key Cause of Climate Change, Study Shows](#) Science Daily, 22DEC2013

Scientists in the UK carried out a study using records of past temperatures constructed with data from tree rings and other historical sources. They compared this data with computer-based models of past climate, featuring both significant and minor changes in the sun. They found that solar activity has had a minimal impact on temperature in the past millennium. [TECHNICAL ARTICLE](#)

Tags: Environmental science, Climatology

## FORECASTING

### [Research fronts 2013](#) Thomson Reuters, 01APR2013

In this first report, we present 100 top-ranked fronts for 2013 across 10 broad areas in the sciences and social sciences. They point to hot areas that may not otherwise be readily identified, even by some of the research institutions at the center of the action for a given front.

Tags: Forecasting

## IMAGING TECHNOLOGY

### [Researchers Point to Digital Gains in Human Recognition](#) Science Daily, 26DEC2013

Researchers in the UK were able to recover the faces of bystanders from reflections in the eyes of photographic subjects. The recovered bystander images could be identified accurately by observers, despite their low resolution. [TECHNICAL ARTICLE](#)

Tags: Imaging technology, S&T UK

## INFORMATION TECHNOLOGY

### [New circuit design allows for elimination of laptop charger brick](#) PhysOrg.com, 24DEC2013

The new adaptor has come about due to the development of a new circuit design by MIT researchers—it's able to run at higher frequencies (between 30MHz and 300MHz—a thousand times faster than conventional adaptors) due to a power reclaiming scheme they developed.

Tags: Information Technology

### [Research trio crack RSA encryption keys by listening to computer noise](#) PhysOrg.com, 19DEC2013

The CPU, for example, emits a high pitched noise as it operates, fluctuating depending on which operations it is performing—other components do likewise. Researchers in Israel set about creating software to interpret noise data obtained using simple microphones and very little other equipment. They also focused exclusively on trying to achieve one single feat: deciphering an RSA encryption key. [TECHNICAL ARTICLE](#)

Tags: Information Technology

## MATERIALS SCIENCE

### [Resistance Makes Waves](#) Science Daily, 23DEC2013

In two complementary studies, two international teams of researchers (USA, Germany, Canada, Japan) have established that superconductivity in cuprates collapses at a maximum of minus 135 degrees Celsius due to the formation of charge-density waves. Consequently, in order to find superconductors that drop to zero resistance at realistic temperatures, materials scientists must search for substances that are not subject to charge-density waves. [TECHNICAL ARTICLE 1, 2](#)

Tags: Materials science

### [Superconductivity Switched On by Magnetic Field](#) Science Daily, 22DEC2013

An international team of researchers (Switzerland, France, Canada, USA) has demonstrated that a novel superconducting state is only created in the material CeCoIn<sub>5</sub> when there are strong external magnetic fields. This state can then be manipulated by modifying the field direction. [TECHNICAL ARTICLE](#)

Tags: Materials science

## MICROELECTRONICS

**Compound Semiconductors Join the Race to Sustain Moore's Law**

IEEE Spectrum, 23DEC2013

Engineers at Imec and IBM have independently developed new manufacturing processes for making the next decade's leading chips, they revealed late last year. These efforts will allow the marriage of silicon wafers and certain exotic materials which holds the key to maintaining the traditional performance improvements associated with Moore's Law and the shrinking of transistor dimensions.

Tags: *Microelectronics*

## FEATURED RESOURCE

**Academia.edu**

Academics use Academia.edu to share their research, monitor deep analytics around the impact of their research, and track the research of academics they follow. Over 940,844 research interests as of December 2013.

## NEUROSCIENCE

**This gene helps some of us never forget a face**

Futurity.org, 24DEC2013

The oxytocin receptor, a gene known to influence mother-infant bonding, also plays a role in the ability to remember faces. The finding has important implications for disorders in which social information processing is disrupted.

TECHNICAL ARTICLE

Tags: *Neuroscience***Absolutely shocking: electrocuting brain can wipe unpleasant memories**

Wired UK, 23DEC2013

Researchers in the Netherlands discovered that strategically timed electric shocks to the brain can effectively destroy thoughts of unpleasant moments in your past. The discovery relies on the theory of memory consolidation, which suggests that memories are plucked from a mental warehouse whenever they are accessed and re-written over time back onto the brain's circuits. TECHNICAL

ARTICLE

Tags: *Neuroscience*

## PHOTONICS

**Solitons in a Crystal: New Light Source Could Serve in Geo-Navigation, Search for Earth-Like Planets**

Science Daily, 23DEC2013

An international team of researchers (Switzerland, Russia) has discovered that optical dissipative solitons can also exist in small millimeter-size optical resonators. They analyzed the extracted light pulses from the resonator and found them to be much shorter than one millionth of one millionth of a second. The high rate of repeated ultra-short light pulses is important for many applications in astronomy, telecommunications, and geo-navigation.

TECHNICAL ARTICLE

Tags: *Photonics*

## S&amp;T POLICY

**Australian Research Council funds \$23-million Centre of Excellence for Nanoscale BioPhotonics**

Nanowerk, 26DEC2013

The Centre is combining expertise in physics, chemistry, materials engineering, biology and medicine to develop new science and new technologies for controlling the interactions between light and matter at the nanometre scale.

Tags: *S&T policy, S&T Australia***China's 2 strongest research fields**

China NOST News, 24DEC2013

There are two fields in which China's research is currently in a leading position. Based on the analysis of Thomson Reuters, China is front runner in research of superconducting materials and condensed matter physics.

Tags: *S&T policy, S&T China***China SignPost™ "Greatest Hits" #2: Military and Security Developments**

China SignPost, 23DEC2013

In the three years since China SignPost was established, Beijing's military developments—both in technical and operational terms—have been nothing short of astounding. It has covered the most important milestones closely, offering insights into dynamics of disproportionate impact while debunking misconceptions that threaten to mislead observers seeking to understand the larger implications.

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

## Data Are Lost to Science at 'Astonishing Rate'

Science Daily, 19DEC2013

Researchers in Canada found that two years after publication, data are essentially always available to other researchers who might wish to confirm the findings. By 20 years post-publication, 80% of that data obtained through publicly funded research is inaccessible due to mundane issues, primarily old email addresses and obsolete storage devices. The researchers call on journals to require that authors share their data on a public archive before a paper can be published. TECHNICAL ARTICLE

*Tags: S&T policy, Science without borders*

## SCIENCE WITHOUT BORDERS

### Intuition and analytical skills matter most in a crisis

Alphagalileo, 23DEC2013

According to researchers in Norway those who make the best decisions in a crisis practise a flexible decision style that switches between intuition and analysis. In a real crisis you need to make the initial decisions quickly, based on your experience-based intuition. As you receive more information, you can analyse your way to adjustments and more decisions.

*Tags: Science without borders*

## SENSORS

### The great ideas hiding

New Scientist, 24DEC2013

UK Physicist John Pendry talks about the profound physics obscured by his invisibility cloak and how metamaterials could help realise the perfect lens.

*Tags: Sensors ■*

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