



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[First discovery of a natural topological insulator](#)

[Nanowerk, 06MAR2013](#)

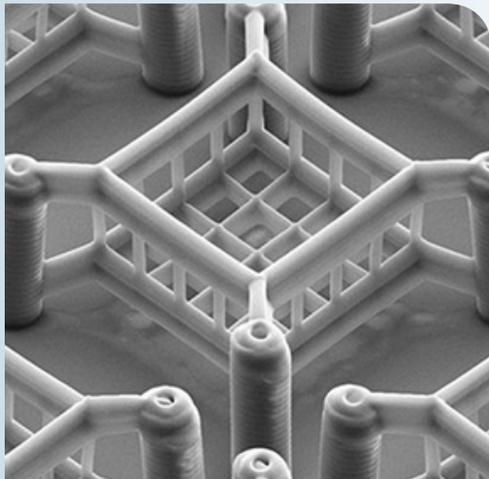
The research team in Germany describes discovering that the mineral Kawazulite, found in the Czech gold mine and processed into nanoflakes, is a natural TI (Topological Insulator). The flakes were so small that thousands would fit inside the dot over an "i." Based on the discovery, natural TIs may exist in other minerals, the report states. TI has potential applications in a new genre of supercomputers. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, S&T Germany, Featured Article

[Micro 3-D Printer Creates Tiny Structures in Seconds](#)

[MIT Technology Review, 05MAR2013](#)

A company in Germany, has developed a tabletop 3-D microprinter that can create complicated microstructures 100 times faster than is possible today.



Micro printing: A scanning electron microscope image shows a cell scaffold printed using Nanoscribe's new device

Tags: Advanced manufacturing, Featured Article

Much of 3-D printing's impact could be at a much smaller scale. Micrometer-scale printing has shown promise for making medical and electronic devices.

[Rainbow Pattern May Allow Laser Damage Monitoring](#)

[American Physical Society Spotlight, 02MAR2013](#)

Researchers in France observed the rainbow pattern as they blasted a series of transparent materials such as glass and quartz with intense laser pulses. The team says that this effect, surprisingly overlooked until now, could offer a way of monitoring laser ablation. Intense light pulses that can precisely sculpt solid materials also reveal information about the surface. [TECHNICAL ARTICLE](#)

Tags: Materials science, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[4D printed objects 'make themselves' \(with video\)](#)

[BBC News, 28FEB2013](#)

Researchers at MIT explained the fourth dimension is time and that over time static objects will transform and adapt. The process uses a specialised 3D printer that can create multi-layered materials. It combines a strand of standard plastic with a layer made from a "smart" material that can absorb water. The water acts as an energy source for the material to expand once it is printed.

Tags: Advanced manufacturing

[Watch the New and Improved Printable Gun Spew Hundreds of Bullets](#)

[Wired Danger Room, 28FEB2013](#)

In the video, dozens of bullets contained in a high-capacity drum magazine are seen being fired by the printed receiver. It is also the first printable receiver to fire .223 caliber high-pressure rifle rounds without breaking. It is important to note that fully 3-D printed guns don't exist yet.

Tags: Advanced manufacturing

continued...

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ADVANCED MATERIALS

Human-made material pushes the bounds of superconductivity[Science Daily, 03MAR2013](#)

A multi-university team (UW-Madison, Florida State and Michigan—led by UW-Madison) of researchers has developed a new multi layer material composed of 24 layers that alternate between the pnictide superconductor and a layer of the oxide strontium titanate. It could lead to breakthroughs in both superconductivity research and in real-world applications, in particular, the ability to transport much more electrical current than non-engineered materials. [TECHNICAL ARTICLE](#)

*Tags: Advanced materials, Materials science***Scalable fabrication of high-power graphene micro-supercapacitors for flexible and on-chip energy storage**[Nature Communications, 12FEB2013](#)

Researchers at UCLA demonstrate a scalable fabrication of graphene micro-supercapacitors over large areas by direct laser writing on graphite oxide films using a standard LightScribe DVD burner. More than 100 micro-supercapacitors can be produced on a single disc in 30 min or less. The devices are built on flexible substrates for flexible electronics and on-chip uses that can be integrated with MEMS or CMOS in a single chip. [VIDEO](#)

Tags: Advanced materials

BIG DATA

Big Data: Searching in Large Amounts of Data Quickly And Efficiently[Science Newsline, 01MAR2013](#)

Researchers at Saarland University, Denmark, developed the “Hadoop Aggressive Indexing Library”, abbreviated with HAIL which enables saving enormous amounts of data in HDFS in such a way that queries are answered up to 100 times faster. The researchers generate an index for the datasets they distribute on several servers. They sort the data according to several criteria at once. The more criteria you provide, the higher the probability that you find the specified data very fast.

Tags: Big data

COMMUNICATIONS TECHNOLOGY

Graphene Antennas Would Enable Terabit Wireless Downloads[MIT Technology Review, 05MAR2013](#)

Researchers at Georgia Tech have drawn up blueprints for a wireless antenna made from graphene that could allow terabit-per-second transfer speeds at short ranges. To make an antenna, the group says, graphene could be shaped into narrow strips of between 10 and 100 nanometers wide and

one micrometer long, allowing it to transmit and receive at the terahertz frequency, which roughly corresponds to those size scales. Electromagnetic waves in the terahertz frequency would then interact with plasmonic waves—oscillations of electrons at the surface of the graphene strip—to send and receive information.

Tags: Communications Technology, Advanced materials, Terahertz technology

ENERGY

Analytical theory may bring improvements to lithium-ion batteries[Science Daily, 05MAR2013](#)

Researchers at Purdue University have shown theoretically how to control or eliminate the formation of “dendrites” that cause lithium-ion batteries to fail, an advance that if realized would improve safety and might enable the batteries to be charged within a matter of minutes instead of hours.

*Tags: Energy, Battery***Solar Energy to Get Boost From Cutting-Edge Forecasts**[Newswise, 05MAR2013](#)

The research team at NCAR is designing a prototype system to forecast sunlight and resulting power every 15 minutes over specific solar facilities, thereby enabling utilities to continuously anticipate the amount of available solar energy. The project takes aim at one of the greatest challenges in meteorology: accurately predicting cloud cover over specific areas. In addition to helping utilities tap solar energy more effectively, detailed cloud predictions can also improve the accuracy of shorter-term weather forecasts.

*Tags: Energy, Government S&T***Renewable Energy: Nanotubes to Channel Osmotic Power'**[Science Daily, 28FEB2013](#)

The salinity difference between fresh water and salt water could be a source of renewable energy. Researchers in France discovered a new means of harnessing this energy: osmotic flow through boron nitride nanotubes generates huge electric currents, with 1,000 times the efficiency of any previous system. The researchers developed a highly novel experimental device that enabled them to study osmotic fluid transport through a single nanotube. [TECHNICAL ARTICLE](#)

*Tags: Energy, Nanotechnology, S&T France***Physicists Demonstrate the Acceleration of Electrons by a Laser in a Vacuum**[Science Daily, 27FEB2013](#)

A research group in China has proposed the capture-acceleration scenario to show that an electron can be

continued...

“Basic research, to which we owe everything, is relatively very cheap when compared with other outlays of modern society.” ALBERT SZENT-GYÖRGYI

accelerated by a tightly focused laser in a vacuum. In capture-acceleration scenario, the diffraction from a tightly focused laser changes not only the intensity distribution of the laser but also its phase distribution, which results in the field phase velocity being lower than the speed of light in a vacuum in some areas. A possible application of this discovery is the use of laser plasma fusion to provide a new energy source. [TECHNICAL ARTICLE 1, 2](#)

Tags: Energy, S&T China

[Clever Battery Completes Stretchable Electronics Package: Can Stretch, Twist and Bend—And Return to Normal Shape](#)

[Science Daily, 26FEB2013](#)

Researchers at the University of Illinois at Urbana-Champaign made a dense array of lithium-ion battery cells on a stretchable material, and wired them together with compact, yet highly extensible wires. These connections take up a very small area of the array, leaving more room for energy-storing materials. But they're packed into dense serpentine squiggles that buckle, then unravel as the battery is stretched as much as 300 percent. [TECHNICAL](#)

[ARTICLE](#)

Tags: Energy, Battery

FORECASTING

[Moore's law is not just for computers](#)

[Nature News, 06MAR2013](#)

The researchers at Santa Fe Institute and MIT evaluated the performance of six laws using hindcasts—use of earlier data to predict later costs—and then looked at how these compared with the actual figures. The most accurate was Wright's law (the cost of aeroplanes fell as the number of planes manufactured rose), but Moore's law was close behind, at least for a relatively modest time horizon of a few decades. [TECHNICAL ARTICLE](#)

Tags: Forecasting

[Global E-mail Patterns Reveal “Clash of Civilizations”](#)

[MIT Technology Review, 05MAR2013](#)

By analysing a global database of e-mail messages, and their locations, sent by more than 10 million people over the space of a year, researchers at Stanford University have confirmed Huntington's 1992 theory that future conflicts would be driven largely by cultural differences. In other words, the way we send e-mails is a reflection of the mesh of civilisations that is an important driver of future conflict. [RELATED ARTICLE](#)

[RELATED ARTICLE](#)

Tags: Forecasting

FOREIGN S&T

[Strong near field enhancement in THz nano-antenna arrays](#)

[Nature Scientific Reports, 02MAR2013](#)

Antenna-like concepts have been recently extended into the THz and up to the visible, however metal losses increase and limit their performances. Researchers in France demonstrate that the combination of array layout with subwavelength electromagnetic confinement allows for 104-fold enhancement of the electromagnetic energy density inside the cavities, despite the low quality factor of a single element.

Tags: Foreign S&T, S&T France, Terahertz technology

IMAGING TECHNOLOGY

[New surface coating for glass could eliminate image distortion caused by condensation \(w/video\)](#)

[Nanowerk, 05MAR2013](#)

A team of MIT researchers has developed a testing method, and used it to find a coating that outperforms others not only in preventing foggy buildups, but also in maintaining good optical properties without distortion. [TECHNICAL ARTICLE, VIDEO](#)

Tags: Imaging technology, Materials science

MATERIALS SCIENCE

[Nanoclusters in steel add strength, stability under irradiated conditions](#)

[Nanowerk, 05MAR2013](#)

In this study, researchers at the University of Wisconsin used various analysis tools, including EMSL's atom probe tomography (APT), focused ion beam, and accelerator capabilities, to examine complex oxide nanoclusters within oxide dispersion strengthened, or ODS, steels to determine their potential resistance and stability under a range of irradiation conditions. [TECHNICAL ARTICLE](#)

Tags: Materials science

[Physicists twist water into knots \(w/video\)](#)

[Nature News, 03MAR2013](#)

3-D-printed vortex maker may improve understanding of braided fluids in nature. More than a century after the idea was first floated, physicists at the University of Chicago, have finally figured out how to tie water in knots in the laboratory. The gnarly feat paves the way for scientists to experimentally study twists and turns in a range of phenomena—ionized gases like that of the Sun's outer

atmosphere, superconductive materials, liquid crystals and quantum fields that describe elementary particles.

Tags: Materials science

[Turbulence in a crystal](#)

Nanowerk, 02MAR2013

Researchers in Germany have observed how the configuration of electrons and atoms in titanium dioxide changes under the impact of an ultraviolet laser pulse, confirming that even subtle changes in the electron distribution caused by the excitation can have a considerable impact on the whole crystal structure. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T Germany

MICROELECTRONICS

[A new generation of programmable shape-memory micro-optics](#)

Nanowerk Spotlight, 04MAR2013

Researchers at the University of Illinois, Urbana-Champaign, have shown that they can mold shape memory polymers into shapes relevant for micro-optics, and that they can exploit shape memory effects in this context to develop new kinds of programmable optical components. [TECHNICAL ARTICLE](#)

Tags: Microelectronics

FEATURED RESOURCE

[Kurzweil AI](#)

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NEUROSCIENCE

[The Human Connectome Project](#)

NIH News, 05MAR2013

The NIH Human Connectome Project is an ambitious effort to map the neural pathways that underlie human brain function. The overarching purpose of the Project is to acquire and share data about the structural and functional connectivity of the human brain. It will greatly advance the capabilities for imaging and analyzing brain connections, resulting in improved sensitivity, resolution, and utility, thereby accelerating progress in the emerging field of human connectomics. [DOWNLOAD DATA](#)

Tags: Neuroscience, Government S&T

[Secrets of human speech uncovered](#)

KurzweilAI, 02MAR2013

A team of researchers at UC San Francisco has uncovered the neurological basis of speech motor control, the complex

coordinated activity of tiny brain regions that controls our lips, jaw, tongue and larynx as we speak. The work has potential implications for developing brain-computer interfaces for artificial speech communication and for the treatment of speech disorders.

Tags: Neuroscience, Artificial intelligence

PHOTONICS

[New spectroscopy method could lead to better optical devices such as LEDs and solar cells](#)

Science Daily, 05MAR2013

The technique called energy-momentum spectroscopy, developed by a multi university team, enables researchers to look at the light emerging from a thin film and determine whether it is coming from emitters oriented along the plane of the film or from emitters oriented perpendicular to the film. Knowing the orientations of emitters could help engineers make better use of thin-film materials in optical devices like LEDs or solar cells. [TECHNICAL ARTICLE](#)

Tags: Photonics

QUANTUM SCIENCE

[Atoms with Quantum Memory](#)

Science Daily, 04MAR2013

Researchers in Austria have shown that ultra cold Bose-Einstein condensates approach a disordered equilibrium state, but there is an intermediate step called "prethermalized state," in which the atoms remain for a surprisingly long time without forgetting about their quantum mechanical origin. This phenomenon does not depend on the temperature, it seems to be a stable, fundamental property of quantum physics. A deeper understanding of this quantum state is expected not only to explain ultra cold Bose-Einstein condensates, it may also shed some light on the processes in the early universe, or it could help to understand phenomena in the quark-gluon-plasma created in high energy particle accelerators. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[Quantum realm: Forging new pathways to quantum devices](#)

Science Daily, 04MAR2013

Physicists at UC Santa Barbara are manipulating light on superconducting chips, and forging new pathways to building the quantum devices of the future—including super-fast and powerful quantum computers. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[Anderson localization of entangled photons in an integrated quantum walk](#)

Nature Photonics, 03MAR2013

Researchers in Italy experimentally study the localization properties of a pair of non-interacting particles obeying

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bosonic/fermionic statistics by simulating a one-dimensional quantum walk (QW) of a two-photon polarization-entangled state in a disordered medium.

Tags: Quantum science, S&T Italy

Getting around the uncertainty principle: Physicists make first direct measurements of polarization states of light

[Science Daily, 03MAR2013](#)

Researchers at the University of Rochester and the University of Ottawa have applied a recently developed technique to directly measure for the first time the polarization states of light. Their work both overcomes some important challenges of Heisenberg's famous Uncertainty Principle and also is applicable to qubits, the building blocks of quantum information theory. [TECHNICAL ARTICLE](#)

Tags: Quantum science, S&T Canada

Space race under way to create quantum satellite

[Institution of Physics, 01MAR2013](#)

In this month's special edition of Physics World, focusing on quantum physics, researchers from Canada describe how a quantum space race is under way to create the world's first global quantum-communication network.

Tags: Quantum science, Communications Technology

Connecting the (Quantum) Dots: First Viable High-Speed Quantum Computer Moves Closer

[Science Daily, 26FEB2013](#)

University of Pittsburgh and Delft University of Technology researchers discovered a new method that better preserves the qubits necessary to power lightning-fast electronics. Hole spins, rather than electron spins, can keep quantum bits in the same physical state up to 10 times longer than before. [TECHNICAL ARTICLE](#)

Tags: Quantum science

S&T POLICY

US science academy celebrates 150 years

[Nature News, 01MAR2013](#)

On 3 March 1863, President Abraham Lincoln signed the US National Academy of Sciences (NAS) into existence. Since then the NAS, an independent science-advisory group in Washington DC, has churned out more than 10,000 reports at the request of US government agencies—3,805 of them between 1996 and 2012. But a Comment in this week's Nature suggests that the academy needs to become more nimble if it is to survive.

Tags: S&T policy

SCIENCE WITHOUT BORDERS

Fermat's Last Theorem and more can be proved more simply

[Science Daily, 04MAR2013](#)

Fermat's Last Theorem—the idea that a certain simple equation had no solutions—went unsolved for nearly 350 years until a Oxford mathematician created a proof in 1995. Now, a researcher at Case Western Reserve University has shown the theorem can be proved more simply.

Tags: Science without borders, Mathematics

Will There Be Enough Water?

[Scientific American, 03MAR2013](#)

A panel at the recent Advanced Research Projects Agency for Energy summit attempted to answer that question. In agriculture, it will take both better breeding—for more water efficient crops—and smarter irrigation.

Tags: Science without borders

SENSORS

Nanotechnology researchers develop material to detect caesium with naked eyes

[Nanowerk, 06MAR2013](#)

Researchers in Japan have developed molecular materials as an optical probe for caesium cation-containing particles with implementation based on simple spray-on reagents and a commonly available fluorescent lamp for naked-eye detection in the solid state. [TECHNICAL ARTICLE](#)

Tags: Sensors, Advanced materials, S&T Japan ■

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