



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[Can the wave function of an electron be divided and trapped?](#)

[Nanowerk, 28OCT2014](#)

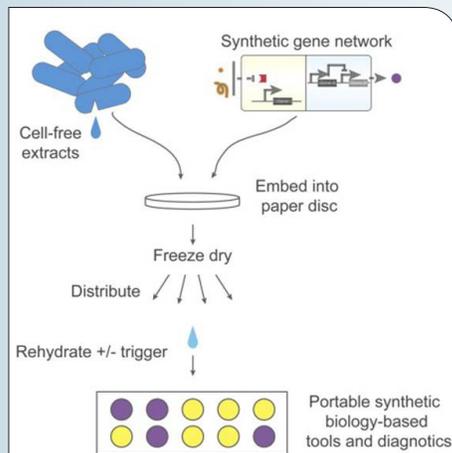
Experiments by researchers at Brown University suggest that the quantum state of an electron—the electron’s wave function—can be shattered into pieces and those pieces can be trapped in tiny bubbles of liquid helium. To be clear, the researchers are not saying that the electron can be broken apart. Electrons are elementary particles, indivisible and unbreakable. But what the researchers are saying is in some ways more bizarre.

[TECHNICAL ARTICLE](#)

Tags: Quantum science, Featured Article

[Printed Dots Detect Ebola \(and More\) Without a Lab](#)

[IEEE Spectrum, 28OCT2014](#)



*Graphical abstract:
Wyss Institute/Harvard University*

20 minutes—whether a patient is infected or not. And the doctor, nurse, or volunteer could do this without advanced skills, extensive sample preparation, expensive reagents, laboratory instruments, or even refrigeration. [TECHNICAL ARTICLE](#), [VIDEO](#)

Tags: Biotechnology, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[A nanorobotics platform for nanomanufacturing](#)

[Nanowerk, 28OCT2014](#)

Researchers at UC San Diego have invented a new nanopatterning approach, named Nanomotor Lithography, which translates the autonomous movement trajectories of nanomotors, or nanorobots, into controlled surface features that brings a twist to conventional static optical fabrication systems. [TECHNICAL ARTICLE](#)

Tags: Advanced manufacturing

ADVANCED MATERIALS

[New solar power material converts 90 percent of captured light into heat](#)

[PhysOrg.com, 29OCT2014](#)

The novel material developed by researchers at UC San Diego features a “multiscale” surface created by using particles of many sizes ranging from 10 nanometers to 10 micrometers. The new material can also withstand temperatures greater than 700 degrees Celsius and survive many years outdoors in spite of exposure to air and humidity.

Tags: Advanced materials, Energy, Materials science

[Three-dimensional metamaterials with a natural bent](#)

[Science Daily, 24OCT2014](#)

Using a type of metamaterial element called a split-ring resonator, an international team of researchers (Japan, Taiwan) succeeded in creating a large metamaterial, up to 4 mm x 4 mm² in size, that is essentially isotropic. The team achieved this breakthrough based on a new fabrication technique that combines top-down electron lithography and a bottom-up self-folding mechanism caused by the intrinsic stress of metals, called the “metal-stress driven self-folding method.” [TECHNICAL ARTICLE](#)

Tags: Advanced materials

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Intelligent materials that work in space**PhysOrg.com, 23OCT2014**

Researchers in Spain have developed a revolutionary new technology based on shape memory of metamaterials that hold the spacecraft's movable parts during the launch and then release them once it is in orbit without having to use pyrotechnics. The advantage of this technology is that it does not produce the vibrations caused by the explosions; in addition, it can be tested on land.

*Tags: Advanced materials***New devices based on metamaterials****Science Daily, 22OCT2014**

An international team of researchers (Spain, UK, USA) has achieved the first experimental demonstration with epsilon-near-zero (ENZ) metamaterials. They designed simulated and analyzed graded index epsilon-near-zero (GRIN-ENZ) quasi-optical components such as beam steerers and power splitters. The potential applications of these media are numerous; for example, in nanocircuits, electrical levitation or invisibility. **TECHNICAL ARTICLE**

*Tags: Advanced materials, Materials science***AUTONOMOUS SYSTEMS & ROBOTICS****Projecting a robot's intentions****MIT News, 29OCT2014**

Researchers at MIT developed a new visualization system, dubbed "measurable virtual reality" (MVR), which combines ceiling-mounted projectors with motion-capture technology and animation software to project a robot's intentions in real time. They then developed computer software that visually renders "hidden" information, such as a robot's possible routes, and its perception of an obstacle's position.

*Tags: Autonomous systems & robotics***Video Friday: Robot Racecar, Kilobot Display, and Humanoid Skin****IEEE Spectrum, 24OCT2014**

Over time, robots (especially complex ones) get out of calibration. Calibrating them over and over is a pain; so ideally, they'd be able to calibrate themselves. They can do this by (say) holding up cards with patterns on them to check joint angles, or some of them can do it through touch.

*Tags: Autonomous systems & robotics***CyPhy Works' New Drone Fits in Your Pocket, Flies for Two Hours****IEEE Spectrum, 23OCT2014**

The drone, developed by a company in the US, weighs a mere 80 grams and sends back high quality HD video. The clever thing that grants its special powers is a microfilament tether that unspools the drone and keeps it constantly connected to communications and power. Once the drone completes its mission, you can replace the microfilament

spooler cartridge with a new one, recharge the base station if necessary, and go again. By hot-swapping base station batteries, or connecting to the grid, the Pocket Flyer can keep aloft even longer than two hours.

*Tags: Autonomous systems & robotics***BREAKTHROUGH TECHNOLOGY****Watching the hidden life of materials****EurekaAlert, 27OCT2014**

Researchers in Canada have succeeded in simultaneously observing the reorganizations of atomic positions and electron distribution during the transformation of the "smart material" vanadium dioxide from a semiconductor into a metal – in a timeframe a trillion times faster than the blink of an eye. The results mark the first time that experiments have been able to distinguish changes in a material's atomic-lattice structure from the relocation of the electrons in such a blazingly fast process. **TECHNICAL ARTICLE**

*Tags: Breakthrough technology, Materials science, S&T Canada***COMMUNICATIONS TECHNOLOGY****255 Terabits/s: Researchers demonstrate record data transmission over new type of fiber****PhysOrg.com, 27OCT2014**

An international team of researchers (the Netherlands, USA) report the successful transmission of a record high 255 Terabits/s over a new type of fiber allowing 21 times more bandwidth than currently available in communication networks. This new type of fiber could be an answer to mitigating the impending optical transmission capacity crunch caused by the increasing bandwidth demand.

TECHNICAL ARTICLE*Tags: Communications Technology***ENERGY****Researchers develop economical process for micro energy harvesting****Nanowerk, 27OCT2014**

Researchers in Germany have developed a process by which they can precipitate highly homogeneous layers on diameters of up to 200 mm with high deposition rates. Thus, the process is substantially more productive and profitable than previous processes. To raise the power yield even higher they use layers made from aluminum-scandium-nitride.

*Tags: Energy, S&T Germany***Cheaper silicon means cheaper solar cells****Science Daily, 22OCT2014**

Researchers in Norway have pioneered a new approach to manufacturing solar cells that requires less silicon and

“If we all did the things we are capable of, we would astound ourselves.”

THOMAS A. EDISON

can accommodate silicon with more impurities than is currently the standard. The new method could reduce the amount of silicon per unit area by 90 per cent compared to the current standard. [TECHNICAL ARTICLE](#)

Tags: Energy

INFORMATION TECHNOLOGY

[‘Eye in the sky’ will bypass Internet traffic jams](#)

[PhysOrg.com](#), 27OCT2014

A team of researchers from Cornell University, the University of Southern California and the University of Massachusetts propose an application called IN-CONTROL (Programmable Inter-Domain Observation and Control) which will collect information from participating networks into a database that network operators can query to find the best routes for their data. It will help operators select the best paths, relay around faults or avoid untrustworthy networks. The database will be distributed in many locations across the Internet for security and scalability.

Tags: Information Technology

[Successful read/write of digital data in fused silica glass with high recording density](#)

[PhysOrg.com](#), 22OCT2014

Researchers in Japan have successfully achieved read/write of digital data in 100 layers of fused silica glass, a recording density comparable to Blu-ray Disc. One hundred multi-layer data recording was verified by the application of newly developed noise reduction technology to overcome interference from data recorded on other layers while trying to access data written in deeper layers within the fused silica glass. Data archived using fused silica glass can withstand storage of over 300 million years.

Tags: Information Technology, S&T Japan

MATERIALS SCIENCE

[‘Reverse engineering’ materials for more efficient heating and cooling](#)

[Nanowerk](#), 28OCT2014

A team of researchers from CalTech and UCLA has developed a new way to analyze the electrical properties of thermoelectrics that have two or more solid phases. The new technique could help researchers better understand multi-phase thermoelectric properties and offer pointers on how to design new materials to get the best properties.

[TECHNICAL ARTICLE](#)

Tags: Materials science

[Emergent behavior lets bubbles ‘sense’ environment](#)

[Science Daily](#), 27OCT2014

According to researchers at UC Davis tiny soapy bubbles can reorganize their membranes to let material flow in and out in response to the surrounding environment. This behavior could be exploited in creating microbubbles that deliver drugs or other payloads inside the body—and could help us understand how the very first living cells on Earth might have survived billions of years ago. [TECHNICAL ARTICLE](#)

Tags: Materials science

[Material gives up its spin-splitting secrets](#)

[Physics World](#), 27OCT2014

An international team of researchers (UK, Japan, Thailand) has combined detailed experiments and theoretical calculations of tungsten diselenide and observed giant spin-splitting in the material even though the material’s structure suggests that any such splitting should be impossible. The possibility of a whole new class of such materials with “hidden” spin-polarization could bring new opportunities for spintronics. [TECHNICAL ARTICLE](#)

Tags: Materials science, Microelectronics

[New evidence for an exotic, predicted superconducting state](#)

[PhysOrg.com](#), 26OCT2014

An international team of researchers (USA, France, Japan) has produced new evidence for an exotic superconducting state that can arise when a superconductor is exposed to a strong magnetic field. They enable transport of super-currents through non-superconducting regions. Thus the current can travel without resistance throughout the entire material in this state. This new understanding could also be relevant to the field of spintronics. [TECHNICAL ARTICLE](#)

Tags: Materials science

MICROELECTRONICS

[A breakthrough toward developing DNA-based electrical circuits](#)

[Nanowerk](#), 26OCT2014

An international team of researchers (Israel, USA, Italy, Spain, Denmark) reports reproducible and quantitative measurements of electricity flow through long molecules made of four DNA strands, signaling a significant breakthrough towards the development of DNA-based electrical circuits. The research could re-ignite interest in the use of DNA-based wires and devices in the development of programmable circuits. [TECHNICAL ARTICLE](#)

Tags: Microelectronics

continued...

Faster switching helps ferroelectrics become viable replacement for transistors

UC Berkeley News, 26OCT2014

A team of researchers from UC Berkeley and the University of Pennsylvania took a thin film of lead zirconate titanate, a common ferroelectric material, and found that by applying the electric field so that it wasn't parallel to the up-down axis, they could change the polarization reorientation pathway. This opens up a faster, alternate route for the electrical charges to follow. Adjusting how the ferroelectric film was confined and stretched enhanced the effect, leading to at least a doubling of the operational speed for the system.

TECHNICAL ARTICLE

Tags: Microelectronics

FEATURED RESOURCE

The International Institute of Forecasters (IIF)

IIF is dedicated to developing and furthering the generation, distribution, and use of knowledge on forecasting. **RSS**

Precise, programmable biological circuits

Science Daily, 23OCT2014

Researchers in Switzerland have developed a biological circuit that controls the activity of individual sensor components using an internal "timer." This circuit prevents a sensor from being active when not required by the system; when required, it can be activated via a control signal. **TECHNICAL ARTICLE 1, 2**

Tags: Microelectronics, Biotechnology

PHOTONICS

Light-matter interaction can turn opaque materials transparent

PhysOrg.com, 27OCT2014

An international team of researchers (France, USA) has developed a new method for manipulating light scattering. They theoretically show how to induce transparency in otherwise opaque materials using the complex dipole-dipole interactions present in a large number of interacting quantum emitters, such as atoms or molecules. This ability could have several potential applications, such as producing slow light or stopped light, along with applications in the field of attosecond physics.

TECHNICAL ARTICLE

Tags: Photonics, Materials science

Topological photonics

Nature Photonics, 26OCT2014

This Review explains the underlying principles and highlights how topological effects can be realized in photonic crystals, coupled resonators, metamaterials and quasicrystals.

Tags: Photonics

Subwavelength optical fibers to diffuse light

Science Daily, 24OCT2014

Researchers in France have discovered a new type of light diffusion in tiny optical fibers. Since the waves generated by the confinement of the light travel along the surface of the microfibers, they are sensitive to environmental factors such as temperature, pressure and ambient gas. This makes it possible to design highly sensitive and compact optical sensors for industry. These results also help improve our knowledge of the fundamental interaction between light and sound on an infinitesimally small scale. **TECHNICAL**

ARTICLE

Tags: Photonics

QUANTUM SCIENCE

Physicists' simple solution for quantum technology challenge

Science Daily, 28OCT2014

Quantum technology devices often depend on harnessing the delicate interaction of atoms. But the methods for trapping these tiny particles are hugely problematic because of the atoms' tendency to interact with their immediate environment. Researchers in the UK show how to make a new type of flexibly designed microscopic trap for atoms involving electromagnetic induction. **TECHNICAL**

ARTICLE

Tags: Quantum science, S&T UK

Spontaneous wave function collapse can suppress acoustic Schrodinger cat states

PhysOrg.com, 28OCT2014

To address the problem of Schrodinger's cat, researchers in Hungary show that macroscopic excitations, or sound waves, vibrating inside a macroscopic object such as a large rock will spontaneously decohere, meaning any acoustic cat states will collapse. The findings open up new perspectives on the concept of macroscopic superposition. **TECHNICAL**

ARTICLE

Tags: Quantum science

A quantum world arising from many ordinary ones

Nature, 24OCT2014

Researchers in Australia suggest that the bizarre behavior of the quantum world could result from interactions between many 'parallel' everyday worlds. On its own,

continued...

each world is ruled by classical Newtonian physics. But together, the interacting motion of these worlds gives rise to phenomena that physicists typically ascribe to the quantum world. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[New amplifier design could improve quantum circuits](#)

[Physics World, 22OCT2014](#)

Josephson travelling-wave parametric amplifier, developed by researchers at UC Berkeley and Lawrence Berkeley National Laboratory, uses a technique called “resonant phase matching”, which is expected to boost the gain in the amplifier by more than 10 dB compared with existing Josephson parametric amplifiers. The new device is also predicted to have a bandwidth of 3 GHz, and together these properties should allow it be used in quantum circuits that operate at multiple frequencies, as well as finding use in extremely sensitive astronomical detectors. [TECHNICAL ARTICLE](#)

Tags: Quantum science, Government S&T

S&T POLICY

[Overhaul of Chinese science spending looms](#)

[Science Magazine, 23OCT2014](#)

According to the state run media, China will reform state research fund management, delegating power to independent institutes in a bid to curb academic corruption and sharpen innovation. The Ministry of Science and Technology, which doled out 22 billion RMB (\$3.6 billion) R&D funding in 2013, may hand over control. Further details of the reform, reportedly to be implemented over 3 to 5 years, have not been revealed.

Tags: S&T policy, S&T China

SCIENCE WITHOUT BORDERS

[A GPS from the chemistry set](#)

[PhysOrg.com, 27OCT2014](#)

Taking advantage of the laws of physical chemistry and chemical computing, an international team of researchers (Switzerland, Hungary, Japan, Scotland) has developed a chemical ‘processor’ that reliably shows the fastest way through a City maze. As the method is basically faster than a satnav system, it could be useful in transport planning and logistics in the future.

Tags: Science without borders

SENSORS

[A new cheap and efficient method to improve SERS](#)

[Nanowerk, 28OCT2014](#)

Researchers in Spain fabricated substrates made of polymer and aluminium with a regular pattern to

cut production costs of substrates, and tackle the lack of reproducibility associated with Surface Enhanced Raman Spectroscopy. The new substrates have demonstrated a comparable or even better signal enhancement. [TECHNICAL ARTICLE](#)

Tags: Sensors

[Identifying ‘stance taking’ cues to enable sophisticated voice recognition](#)

[PhysOrg.com, 28OCT2014](#)

Researchers at the University of Washington are working on the Automatic Tagging and Recognition of Stance (ATAROS) project to train computers to recognize the various stances, opinions and attitudes that can be revealed by human speech. What is it about the way we talk that makes our attitude clear while speaking the words, but not necessarily when we type the same thing? How do people manage to send different messages while using the same words? These are the types of questions the ATAROS project seeks to answer.

Tags: Sensors, Artificial intelligence

[Feathers in flight inspire anti-turbulence technology](#)

[Science Daily, 27OCT2014](#)

The system developed by researchers in Australia is based on the concept of phase-advanced sensing, in which flow disturbance is sensed before it results in aircraft movement. This can be achieved by early sensing of the pressures from gust effects on the leading parts of the wing or by measuring the gusts ahead of the wing. Flight testing on a micro plane showed the system significantly reduced the effects of turbulence. [TECHNICAL ARTICLE](#)

Tags: Sensors, S&T Australia ■

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