



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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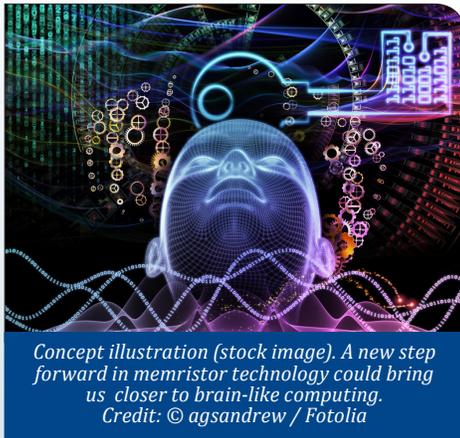
[Science Daily, 06APR2015](#)

Researchers at Northwestern University used single-layer molybdenum disulfide (MoS₂),

an atomically thin, two-dimensional nanomaterial semiconductor with a well-defined grain boundary. The grain boundaries influence the flow of current, so they can serve as a means of tuning resistance. By using MoS₂ with this grain boundary defect instead of the typical metal-oxide-metal memristor structure, the team presented a novel three-terminal memristive device that is widely tunable with a gate electrode.

[TECHNICAL ARTICLE](#)

Tags: Information Technology, Featured Article



*Concept illustration (stock image). A new step forward in memristor technology could bring us closer to brain-like computing.
Credit: © agsandrew / Fotolia*

[Future electronics based on carbon nanotubes](#)

[Science Daily, 07APR2015](#)

A big barrier to building useful electronics with carbon nanotubes has always been the fact that when they're arrayed into films, a certain portion of them will act more like metals than semiconductors. But now an international team of researchers (USA, China) has shown how to strip out the metallic carbon nanotubes from arrays using a relatively simple, scalable procedure that does not require expensive equipment.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials

[Researchers to develop a nanotechnology lubricant suitable for space applications](#)

[Nanowerk, 06APR2015](#)

Due to extreme temperature, pressure and radiation conditions, conventional oils and greases cannot be used in space. Researchers in Estonia are developing a lubricant based on the combination of nanoparticles and ionic liquids. In a normal environment, ionic liquids are liquid salts with extremely low volatility. The novel lubricant must be effective under both normal pressure and under vacuum, both in high and low temperature.

Tags: Advanced materials

[Perfect electromagnetic absorbers via artificial magnetism](#)

[Nanotechweb, 03APR2015](#)

An international team of researchers (USA, Saudi Arabia) focuses on the optimal synthesis of realistic graphene metasurfaces to design a tunable and modulatable THz absorber. Their goal is to achieve broad- and/or multi-band operation via the use of multiple graphene metasurfaces stacked on top of each other.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials

S&T NEWS ARTICLES

ADVANCED MATERIALS

[Carbon nanotube computing?](#)

[Science Daily, 07APR2015](#)

Instead of creating circuits from arrays of discrete components, an international team of researchers (UK, Brazil) took a random disordered material and then 'trained' the material to produce a desired output. They used a mixture of carbon nanotubes and polymer, which creates a complex electrical structure. When voltages are applied at points of the material, its electrical properties change. When the correct signals are applied to the material, it can be trained or 'evolved' to perform a useful function.

[TECHNICAL ARTICLE](#)

Tags: Advanced materials

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This yarn conducts electricity[Science Magazine, 03APR2015](#)

Researchers in China have created an ultrathin, fabric circuit that keeps high conductivity even while bending and stretching. The fiber's core mimics spandex, consisting of an elastic synthetic thread—polyurethane—twinned by two cotton yarns. These stretchy strings were then dipped in silver nanoparticles to instill conductivity and then liquid silicone to encase everything. This silver nanoyarn could stretch to 500% of its original length—and retain a high conductivity. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Flexible electronics, S&T China

New breakthrough in thermoelectric materials[PhysOrg.com, 02APR2015](#)

An international team of researchers (South Korea, USA) used liquid-flow assisted sintering to combine antimony, bismuth and telluride granules into a new thermoelectric alloy (Bi_{0.5}Sb_{1.5}Te₃). Additional melted tellurium was used to fuse Bi_{0.5}Sb_{1.5}Te₃ granules into a solid alloy. The new alloy is nearly twice as efficient as existing materials and may lead to localized electrical power generation, effective cooling mechanisms and new TE devices. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

Two-dimensional dirac materials: Structure, properties, and rarity[Nanowerk, 02APR2015](#)

Dirac cones give graphene massless fermions, leading to various quantum Hall effects, ultra high carrier mobility and many other novel phenomena and properties. Researchers in China report that other 2D materials, such as silicene and germanene and several graphynes, possess Dirac cones. A thorough understanding on the existing conditions of Dirac cones is greatly helpful in seeking/designing new systems. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, S&T China

Controlling defects in engineered liquid crystals[PhysOrg.com, 31MAR2015](#)

Using very strong laser tweezers to locally melt the liquid crystal into a phase where the molecules are oriented in all directions, researchers in Slovenia created several pairs of defects. Because these defects are typically preserved when subjected to stretching and bending, they offer an ideal physical model of topology. Researchers believe that their findings could ultimately open the door to controlling the flow of light using light of a specific frequency in the Gigahertz range in liquid crystal photonic microdevices. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Materials science

AUTONOMOUS SYSTEMS & ROBOTICS

Octopus-inspired robot—the fastest underwater robot based on the given power[PhysOrg.com, 03APR2015](#)

An international team of researchers (Singapore, USA) has developed a new octopus-inspired robot which can zip through water 10 times its body length within one second. This validates the physics of shape change. They used a polycarbonate 3D printed streamlined skeleton which had no moving parts and no energy storage device other than a thin elastic outer membrane which works like blowing up a balloon and then releasing it to fly around the room. [TECHNICAL ARTICLE](#)

Tags: Autonomous systems & robotics

ENERGY

Miniature wires could help devices convert heat, including own waste heat, into electricity[Science Daily, 06APR2015](#)

A mathematical model developed by researchers in Singapore describes the movement of phonons, which are responsible for carrying heat in insulating materials. Their results suggest that heat conduction in a nanowire does not just depend on the relative concentrations of the alloy atoms and the difference in their masses; it also depends on how the atoms are distributed. The model could help scientists design composite materials with low thermal conductivity for thermoelectric devices. [TECHNICAL ARTICLE](#)

Tags: Energy, Materials science

Ultra-fast charging aluminum battery offers safe alternative to conventional batteries[PhysOrg.com, 06APR2015](#)

Researches at Stanford University placed aluminum anode and graphite cathode, along with an ionic liquid electrolyte, inside a flexible polymer-coated pouch. The battery was able to withstand more than 7,500 cycles without any loss of capacity. The battery has the potential for use in flexible electronic devices. Aluminum is also a cheaper metal than lithium. [TECHNICAL ARTICLE](#)

Tags: Energy, Battery

EXPLOSIVES

Ultrasonic hammer sets off tiny explosions[PhysOrg.com, 03APR2015](#)

Researchers at the University of Illinois at Urbana-Champaign used ultrasonic hammer to bombard the material with ultrasound waves, watching with a fast infrared camera to detect any hot spots. They saw that the ultrasound triggered local hot spots and tiny explosions within the material, without destroying the material

“Anybody can make the simple complicated. Creativity is making the complicated simple.”

CHARLES MINGUS

completely. Instead of one big bang, there were 20,000 little bangs per second. They were able to produce hot spots at targeted locations with temperatures soaring at rates of 40,000 degrees F per second. [TECHNICAL ARTICLE](#)

Tags: Explosives

FORECASTING

[Computer sharing of personality in sight: inventor](#)

[PhysOrg.com, 03APR2015](#)

Speaking at a symposium at Stanford University, inventor Sebastian Thrun of Google said that the world has only touched the surface of technological progress and computers may soon be able to transmit the complexities of human personalities. Perhaps we can get to the point where we can outsource our own personal experiences entirely into a computer—and possibly our own personality.

Tags: Forecasting, Disruptive technology, Emerging technology

IMAGING TECHNOLOGY

[Want a quick 3-D copy of something? Camera chip for smartphone provides superfine 3-D resolution](#)

[Science Daily, 03APR2015](#)

Researchers at Caltech have developed a cheap, compact yet highly accurate new device known as a nanophotonic coherent imager (NCI) which uses an inexpensive silicon chip less than a millimeter square in size. The NCI provides the highest depth-measurement accuracy of any such nanophotonic 3-D imaging device. An array of tiny LIDARs on the imager can simultaneously image different parts of an object or a scene without the need for any mechanical movements within the imager. The imager could be applied to a broad range of applications from very precise 3-D scanning and printing to helping driverless cars avoid collisions to improving motion sensitivity in superfine human machine interfaces.

[TECHNICAL ARTICLE](#)

Tags: Imaging technology

INFORMATION TECHNOLOGY

[Operational parameters for a promising thermo-magnetic data-storage technology](#)

[Science Daily, 06APR2015](#)

Researchers in Singapore discovered that when the material was laser heated to near its Curie temperature, the strength of the magnetic field required to induce

complete magnetic switching was about 13 per cent of the intrinsic magnetic ‘coercivity’ of the islands. The discovery adds to the understanding of thermo-magnetic reversal process. [TECHNICAL ARTICLE](#)

Tags: Information Technology, Materials science

[Physically dynamic surfaces may herald another tablet revolution](#)

[PhysOrg.com, 03APR2015](#)

Dynamic physical geometry will fundamentally change the way we approach computer interaction. Displays with pixels that can physically protrude from the surface will allow developers to enhance familiar applications such as architecture, design, terrain modelling and photography by rendering computer-generated 3D scenes in three dimensions in the real world. This opens all sorts of opportunities for novel applications in team collaboration, tangible entertainment and ways to make computing more accessible to those with disabilities.

Tags: Information Technology, Emerging technology

[Restoring lost data](#)

[NSF News, 03APR2015](#)

A team of researchers in the US (Ferris State University, George Mason University) theorized that using three-dimensional digital laser microscopy to capture 3-D image of the optical disc could provide a visual roadmap of the data. This and a special computer algorithm capable of recognizing its patterns could aid in recovering the vast majority of the lost data.

Tags: Information Technology, Government S&T

[Using shortest path to discover criminal community](#)

[arXiv, 21MAR2015](#)

Extracting a smaller sample that embodies the relationships of a list of suspects is an important part of the beginning of an investigation. An international team of researchers (Australia, Malaysia) present the efficacy of their shortest paths network search algorithm (SPNSA) that begins with an “algorithm feed”, a small subset of nodes of particular interest, and builds an investigative sub-network. The algorithm feed may consist of known criminals or suspects, or persons of influence.

Tags: Information Technology

MATERIALS SCIENCE

[Tunneling across a tiny gap](#)

[MIT News, 07APR2015](#)

A team of researchers in the US (MIT, University of Oklahoma, Rutgers University) has developed a unified

continued...

framework that calculates heat transport at finite gaps, and shown that heat flow at sub-nanometer distances occurs not via radiation or conduction, but through “phonon tunneling”. The finding clarifies our physical understanding of the processes and sheds new light on the contact-resistance issue between two materials in close contact. [TECHNICAL ARTICLE](#)

Tags: Materials science

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](#)

[Unparticles may provide a new path to superconductivity](#)

[PhysOrg.com](#), 07APR2015

Unparticles are a hypothetical form of matter. While a particle’s mass always stays the same, even though its energy and momentum may change, in an unparticle mass, energy, and momentum, must scale up or down equally. An international team of researchers (Germany, USA) propose that, if unparticles were present in superconductors, then they would assist the normal electrons in pairing, acting as the glue that holds them together in Cooper pairs. As a result, the material can become superconducting. [TECHNICAL ARTICLE](#)

Tags: Materials science

[Polymeric material that changes its structure in salt water could help protect ships and marine structures](#)

[Science Daily](#), 06APR2015

An international team of researchers (Singapore, the Netherlands) has created a self-assembling polymeric material that changes its structure when moved from water to an electrolyte solution, such as salt water. The material could help improve coatings used to protect surfaces from the build-up of biological contaminants, particularly surfaces under the sea. [TECHNICAL ARTICLE](#)

Tags: Materials science

[Researchers use ‘soft’ nanoparticles to model behavior at interfaces](#)

[PhysOrg.com](#), 06APR2015

An international team of researchers (UK, USA) has shown how to make nanoparticles that are attracted to an oil-water interface but not to each other, creating a

system that acts as a two-dimensional liquid. By measuring this liquid’s pressure and density, they have shown a way forward in using it for a variety of applications, such as in nanomanufacturing, catalysis and photonic devices.

[TECHNICAL ARTICLE](#)

Tags: Materials science

[Nano-GaN Power Electronic Devices project to convert energy more efficiently](#)

[Nanowerk](#), 03APR2015

An international team of scientists (Ireland, USA) will attempt to bend out Gallium Nitride’s defects, making it more stable so it can be used to convert high voltages to more manageable levels, without the current high energy losses. It has the potential to produce significant energy saving efficiencies. The new technology is expected to be particularly impactful on the development of electric and hybrid vehicles.

Tags: Materials science

MICROELECTRONICS

[Maze-solving automatons can repair broken circuits \(w/ video\)](#)

[PhysOrg.com](#), 07APR2015

Researchers in India have developed an intelligent self-healing mechanism that can locate open circuit faults, even when not in the line of sight, and then repair them by building bridges of tiny conductive particles to close the gap. The real-time repair mechanism could be especially useful for space technology. [TECHNICAL ARTICLE](#)

Tags: Microelectronics

[Controlled pure germanium nanodots for non-volatile memory applications](#)

[Nanotechweb](#), 03APR2015

Researchers in China propose a novel method to fabricate an array of pure Ge nanodots for non volatile memory at room temperature. First, amorphous Ge (a-Ge) NDs with controlled size, density and arrangement are defined by an electron beam lithography system. These NDs are then capped with a SiO₂ layer and subsequently irradiated with UV radiation using a pulsed excimer laser. The memory window can be used to define ‘1’ and ‘0’ states at program operation. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, S&T China

NEUROSCIENCE

[The brain game: How decreased neural activity may help you learn faster](#)

[Science Daily](#), 06APR2015

In a study, a team of researchers in the US (University of Pennsylvania, UC Santa Barbara, Johns Hopkins Medical Institution) showed that the critical distinction was in the cognitive control centers, the frontal cortex and the

anterior cingulate cortex, not seeing the cues that the participants were trying to learn. These cognitive control centers are among the last brain regions to fully develop in humans, which may help explain why children are able to acquire new skills quickly as compared to adults.

TECHNICAL ARTICLE

Tags: Neuroscience

PHOTONICS

Physicists propose method to measure variations in the speed of light

[PhysOrg.com](#), 06APR2015

The speed of light, c , is one of the best-known constants. But in some alternative theories of cosmology, the speed of light is not actually constant, but varies throughout time and space. An international team of researchers (Poland, Spain) has proposed a way to constrain possible speed-of-light variations and show that future experiments might be able to detect these variations, if large enough. **TECHNICAL ARTICLE**

Tags: Photonics, Science without borders

QUANTUM SCIENCE

Entangled Static

[American Physical Society Spotlight](#), 03APR2015

Researchers in Canada drove current through a tunnel junction by applying a voltage that oscillated at a microwave frequency and analyzed the resulting noise in the current at two frequencies, f_1 and f_2 . Their results implied that photons emitted at f_1 and f_2 are entangled and therefore could be used for quantum cryptography or other quantum information applications. **TECHNICAL ARTICLE**

Tags: Quantum science, S&T Canada

Physicists create new molecule with record-setting dipole moment

[Science Daily](#), 03APR2015

A team of researchers in the US (University of Oklahoma, Western Washington University, Harvard-Smithsonian Center for Astrophysics) has created a new molecule based on the interaction between a highly-excited Rydberg atom and a ground-state atom. A unique property of the molecule is the large permanent dipole moment, which reacts with an electric field much like a bar magnet reacts with a magnetic field. The research may open up a pathway to construct quantum computers.

TECHNICAL ARTICLE

Tags: Quantum science

Quantum material, frustrated magnets: New experiment reveals clues to their discontent

[Science Daily](#), 03APR2015

Researchers at Princeton University report an unlikely behavior in a class of materials called frustrated magnets, addressing a long-debated question about the nature of these discontented quantum materials. The work represents a surprising discovery that down the road may suggest new research directions for advanced electronics. The study also someday may help clarify the mechanism of high-temperature superconductivity. **TECHNICAL ARTICLE**

Tags: Quantum science, Materials science

Secured Optical Communications Using Quantum Entangled Two-Photon Transparency Modulation

[NASA STI](#), 31MAR2015

Researchers at NASA disclosed a system and method wherein optical signals are coded in a transmitter by tuning or modulating the interbeam delay time (which modulates the fourth-order coherence) between pairs of entangled photons. The advantage of the disclosed system is that it eliminates a need of a coincidence counter to realize the entanglement-based secure optical communications because the absorber acts as a coincidence counter for entangled photon pairs.

Tags: Quantum science, Government S&T, NASA

SENSORS

Better sensors for medical imaging, contraband detection

[MIT News](#), 06APR2015

Researchers at MIT have developed a new, ultrasensitive magnetic-field detector that is 1,000 times more energy-efficient than its predecessors. It could lead to miniaturized, battery-powered devices for medical and materials imaging, contraband detection, and even geological exploration.

Tags: Sensors ■

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