



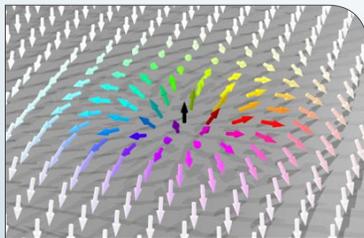
S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

Researchers achieve controlled movement of skyrmions

[Nanowerk, 07MAR2016](#)

The magnetic structure of a skyrmion is symmetrical around its core; arrows indicate the direction of spin. (Image: Benjamin Krüger, JGU)

An international team of researchers (USA - MIT, UC Berkeley, Lawrence Berkeley National Laboratory, UC Santa Cruz, Germany, South Korea) demonstrated that individual skyrmions can be moved in a controlled manner along a magnetic

wire, i.e., the so-called racetrack, by exposing them to brief electrical impulses at room temperature. In addition, new methods to describe their dynamics were developed and confirmed by experimentation. The research has laid down the cornerstone for the future use of skyrmions in application-related systems. [TECHNICAL ARTICLE](#)

Tags: [Information Technology](#), [Featured Article](#)

Engineered swarbots rely on peers for survival

[Science Daily, 29FEB2016](#)

A team of researchers in the US (Duke University, Columbia University) engineered a non-pathogenic strain of E. coli to produce a chemical called AHL which causes the cells to produce an antidote to antibiotics. When the population of E. coli is dense enough, the antidote keeps them alive even in the presence of antibiotics. As long as the E. coli remained inside their container where their density was high, they all survived. But if individual bacteria escaped, they were quickly killed off by the antibiotic. The system could be used as a safeguard to stop genetically modified organisms from escaping into the surrounding environment. [TECHNICAL ARTICLE](#)

Tags: [Biotechnology](#), [Featured Article](#)

S&T NEWS ARTICLES

ADVANCED MATERIALS

[New composite material that traps oxygen selectively could be useful for energy applications such as fuel cells](#)

[PhysOrg.com, 08MAR2016](#)

Metal Oxide Frameworks (MOFs) pull gases out of air or other mixed gas streams, but fail to do so with oxygen. Now, an international team of researchers (USA - Pacific Northwest National Laboratory, Argonne National Laboratory, the Netherlands) has overcome this limitation by creating a composite of a MOF and a helper molecule in which the two work in concert to separate oxygen from other gases simply and cheaply. The findings may have application in making pure oxygen for fuel cells, oxygen sensors, or for other industrial processes. [TECHNICAL ARTICLE](#)

Tags: [Advanced materials](#)

[New material can control excitons at room temperature](#)

[PhysOrg.com, 07MAR2016](#)

An international team of researchers (USA - UC San Diego, UK) used the mechanical exfoliation method to build new structures from a specially designed set of ultrathin layers of materials—molybdenum disulfide and hexagonal boron nitride—each a single atom thick. Unlike GaAs excitons, the specially designed structures help keep excitons bound more tightly together so that they can survive at room temperature. The research may lead to a new generation of optoelectronic devices. [TECHNICAL ARTICLE](#)

Tags: [Advanced materials](#)

[MesoGlue: A game-changing substance for nanotechnology \(w/video\)](#)

[Nanowerk, 03MAR2016](#)

Researchers at the University of North Florida have developed a metallic adhesive which would improve heat transfer in electronic devices. It would also replace the soldering process and make it easier to

[continued...](#)

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piece together tiny parts at room temperature. It would replace thermal grease and increase power and lifetime of computer chips.

Tags: Advanced materials

Physicists get a perfect material for air filters
[PhysOrg.com, 02MAR2016](#)

An international team of researchers (Russia, USA - George Mason University) have developed a material made of nylon nanofibers which is lightweight (10-20 mg/m²), almost invisible (95 percent light transmission), and has low resistance to airflow and efficient interception of less than 1 micrometer fine particulate matter. The material has application in biological research. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

Researchers stack the odds for novel optoelectronic 2-D materials
[Science Daily, 02MAR2016](#)

Stacking layers of nanometer-thin semiconducting materials at different angles is a new approach to designing the next generation of energy-efficient transistors and solar cells. A team of researchers in the US (Oak Ridge National Laboratory, Rensselaer Polytechnic Institute) used the vibrations between two layers to decipher their stacking patterns. Their study provides a platform for engineering two-dimensional materials with optical and electronic properties that strongly depend on stacking configurations. [TECHNICAL ARTICLE](#)

Tags: Advanced materials, Government S&T

Novel ceramics convert wasted heat into electricity
[PhysOrg.com, 01MAR2016](#)

Using zinc oxide, researchers in England designed nanostructured ceramics, which are thermoelectric materials that convert the heat produced in industrial processes into electrical energy. The new ceramic can be used to take advantage of the heat released in thermoelectric plants and generate enough electricity to power light bulbs.

Tags: Advanced materials, Energy, S&T UK

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Robot Scorpion, Jibo A Capella, and Anti-Drone Bazooka
[IEEE Spectrum, 04MAR2016](#)

Getting industrial robots to work safely alongside humans is still a challenge, and CMU's Intelligent Workcell Project is experimenting with different ways of keeping humans from getting crushinated.

Tags: Autonomous systems & robotics

BIG DATA

Big data for text: Next-generation text understanding and analysis
[EurekAlert, 07MAR2016](#)

Researchers in Germany have developed a novel text analysis technology that considerably improves searching very large text collections by means of artificial intelligence. It helps to map words and phrases to their correct objects of the real-world, that way resolving ambiguities automatically. The smart search engine continuously learns and improves over time, and also automatically associates new text entries to matching categories.

Tags: Big data

CYBER SECURITY

Researchers develop an intelligent data scanner that allows to scan the Internet to detect signs of organized crime
[PhysOrg.com, 03MAR2016](#)

A team of EU researchers has developed an intelligent data scanning system that allows to scan web pages and e-mails to search evidences of organized crime, as well as estimating the risk of occurrence of certain illegal activities. It was developed under the EU sponsored project ePOOLICE.

Tags: Cyber security, S&T EU

Bad vibrations: Researchers find security breach in 3-D printing process
[Science Daily, 02MAR2016](#)

Researchers at UC Irvine showed that a device as ordinary and ubiquitous as a smartphone can be placed next to a machine and capture acoustic signals that carry information about the precise movements of the printer's nozzle. The recording can then be used to reverse engineer the object being printed and re-create it elsewhere. Detailed processes may be deciphered through this new kind of cyberattack, presenting significant security risks.

Tags: Cyber security

ENERGY

New material increases the lifetime of solar-powered electrons
[PhysOrg.com, 03MAR2016](#)

An international team of researchers (USA - Pacific Northwest National Laboratory, Argonne National Laboratory, UK) report that the interface between the oxide materials, one containing strontium and titanium and one containing lanthanum and chromium absorbs visible light producing electrons and holes. By carefully synthesizing this material as a series of alternating layers, they created a built-in electric field that could help separate the excited electrons and holes and improve the material's performance

“There is no harm in doubt and skepticism, for it is through these that new discoveries are made.” RICHARD FEYNMAN

as a catalyst. Electrons may then be driven to the surface, where they could interact with water molecules to break their bonds and produce hydrogen fuel. [TECHNICAL ARTICLE](#)

[ARTICLE](#)

Tags: Energy, Advanced materials

[Converting atmospheric carbon dioxide into batteries](#)

[Science Daily, 02MAR2016](#)

A team of researchers in the US (George Washington University, Vanderbilt University) adapted a solar-powered process that converts carbon dioxide into carbon so that it produces carbon nanotubes. They demonstrated that the nanotubes can be incorporated into both lithium-ion batteries like those used in electric vehicles and electronic devices and low-cost sodium-ion batteries under development for large-scale applications, such as the electric grid. [TECHNICAL ARTICLE](#)

Tags: Energy, Battery

[Molecular architectures see the light](#)

[Science Daily, 02MAR2016](#)

Organic photovoltaics bear great potential for large-scale, cost-effective solar power generation. One challenge to be surmounted is the poor ordering of the thin layers on top of the electrodes. Utilizing self-assembly on atomically flat, transparent substrates, an international team of researchers (Germany, France) has engineered ordered monolayers of molecular networks with photovoltaic responses. The findings open up intriguing possibilities for the bottom-up fabrication of optoelectronic devices with molecular precision. [TECHNICAL ARTICLE](#)

Tags: Energy, Advanced materials, Solar energy

[‘Water Battery’: Charging water by means of a mini water bridge](#)

[Science Daily, 01MAR2016](#)

If extremely pure water is placed in two beakers and subject to a high voltage, the fluid moves up the side of each beaker and forms a floating water bridge between the two vessels. An international team of researchers (the Netherlands, Austria) has now demonstrated that if the water bridge is suddenly switched off the proton charges remain. Initial investigations have shown that the fluid’s charge remains stable for one week. The realisation that such water bridges can be used as electrochemical or biochemical reactors opens up a variety of possible industrial applications. [TECHNICAL ARTICLE](#)

Tags: Energy, Solar energy

ENVIRONMENTAL SCIENCE

[Scientists find clues to the mystery of what causes lightning](#)

[PhysOrg.com, 01MAR2016](#)

An international team of researchers (USA - New Mexico Institute of Mining and Technology, Los Alamos National Laboratory, China) has reported that narrow bipolar events are caused by a newly recognized type of discharge called fast positive breakdown, and the data suggests that this same discharge initiates most or even all of the lightning flashes typically seen in thunderstorms. The results could help scientists better understand how a cloud can generate a current that is powerful enough to cause lightning. [TECHNICAL ARTICLE](#)

Tags: Environmental science, Climatology

FORECASTING

[\(Rain\) cloud computing: Researchers work to improve how we predict climate change](#)

[Science Daily, 03MAR2016](#)

A team of researchers in the US (Argonne National Laboratory, University of Chicago, Purdue University) explored a new method for calculating the likelihood of extreme weather events. Their new method, designed specifically for looking at chunks of the model rather than the entire US, was better at predicting days with extreme heat than conventional techniques. It should add accuracy for other extremes, like precipitation, as well. [TECHNICAL ARTICLE 1, 2](#)

Tags: Forecasting, Climatology

IMAGING TECHNOLOGY

[Researchers develop algorithms that let machines understand speech with human-like speed, accuracy](#)

[PhysOrg.com, 03MAR2016](#)

Interacting with the relatively slow pace of current voice interfaces is one reason many people continue to find them inefficient and frustrating to use. Researchers at the University of Southern California are studying new techniques that can streamline human-machine conversations by enabling the system to perform all of the necessary computer processing steps in real-time while the user is talking. [TECHNICAL ARTICLE](#)

Tags: Imaging technology

INFORMATION TECHNOLOGY

'Bending current' opens up the way for a new type of magnetic memory

Nanowerk, 04MAR2016

In a MRAM, bits are projected by the direction of the spin of the electrons in a piece of magnetic material. Large quantities of electrical current are needed to flip the spin of the electrons over to the correct side in order to store data. Researchers in the Netherlands developed a method to flip the magnetic bits faster and more energy-efficiently by sending a current pulse under the bit which bends the electrons at the correct spin upward. [TECHNICAL ARTICLE](#)

Tags: Information technology, Quantum science

Researchers have created a breakthrough model biological supercomputer

PhysOrg.com, 03MAR2016

In the model bio-supercomputer, built by researchers working on the EU-funded project ABACUS, the circuit is around 1.5 cm square and instead of electrons being propelled by an electrical charge, as is the case with a traditional microchip, short strings of proteins travel around the circuit in a controlled way. These movements are powered by ATP. The bio-supercomputer hardly heats up at all and is consequently much more sustainable and cost-effective.

Tags: Information technology, S&T EU

FEATURED RESOURCE

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Current events and breaking news in physical, biological, environmental, space and computer sciences. [RSS](#)

MATERIALS SCIENCE

A proposed superconductivity theory receives exclusive experimental confirmation

Science Daily, 04MAR2016

At the core of most models for the high-temperature superconductivity in cuprates lies the idea of the electron-electron pairing. The paper by an international team of researchers (South Korea, China, USA - UC Riverside) proposed that the breakdown of the quasi-particle concept occurs due to a simple form of quantum-critical fluctuations. They formulated a theory for how quantum fluctuations coupled to electrons give rise to the observed symmetry in superconductivity. [TECHNICAL ARTICLE](#)

Tags: Materials science

Carbon nanotubes improve metal's longevity under radiation

MIT News, 02MAR2016

One of the main reasons for limiting the operating lifetimes of nuclear reactors is that metals exposed to the strong radiation environment near the reactor core become porous and brittle, which can lead to cracking and failure. An international team of researchers (USA - MIT, Texas A&M University, South Korea, Chile, Argentina) has found that, at least in some reactors, adding a tiny quantity of carbon nanotubes to the metal can dramatically slow this breakdown process. [TECHNICAL ARTICLE](#)

Tags: Materials science, Nuclear energy

MICROELECTRONICS

Spinning better electronic devices

PhysOrg.com, 02MAR2016

Using a combination of sputtering and pulsed laser deposition, a team of researchers in the US (UC Riverside, University of Arizona) successfully showed that the 50-100 nanometer thick magnetic insulator, such as yttrium iron garnet, is not only magnetic and insulating, but also of high quality when it is grown on 5 nanometer thick platinum. The signal transmission can be switched on and off and modulated in its strength by a magnetic field. The development could help create more energy efficient electronic devices. [TECHNICAL ARTICLE](#)

Tags: Microelectronics

NEUROSCIENCE

The supremely intelligent rat-cyborg

PhysOrg.com, 07MAR2016

An international team of researchers (Spain, France, USA - Harvard Medical School, China) trained six rats to run a series of unique mazes. To compare the performance of the rats to that of a computer, they developed a maze-solving algorithm. Rats completed the same set of mazes, but this time with the assistance of the computer algorithm. A maze that was challenging for a rat was similarly challenging for the computer and the rat's cyborg counterpart. These findings suggest that optimal intelligence may not reside exclusively in man or machine, but in the integration of the two. By harnessing the speed and logic of artificial computing systems, we may be able to augment the already remarkable cognitive abilities of biological neural systems, including the human brain. [TECHNICAL ARTICLE 1, 2](#)

Tags: Neuroscience, Artificial intelligence

Better memory through electricity

KurzweilAI, 01MAR2016

Researchers in Italy have developed a noninvasive technique, Direct Current Stimulation (tDCS), to boost the memory and mental performance of laboratory mice. After exposing the mice to single 20-minute tDCS sessions, the researchers saw

signs of improved memory and brain plasticity in the hippocampus which lasted at least a week. [TECHNICAL ARTICLE](#)

Tags: Neuroscience, S&T Italy

PHOTONICS

[Giant step towards 'holy grail' of silicon photonics](#)

[Science Daily, 07MAR2016](#)

Researchers in the UK have successfully integrated a laser directly grown onto a silicon substrate. The 1300nm wavelength laser has been shown to operate at temperatures of up to 120°C and for up to 100,000 hours. The research will transform computing and the digital economy, revolutionise healthcare through patient monitoring, and provide a step-change in energy efficiency. [TECHNICAL ARTICLE](#)

Tags: Photonics, S&T UK

[Ultra-bright light: A new source of quantum light](#)

[Science Daily, 07MAR2016](#)

By nanometrically-precise positioning of a quantum dot within an optical microcavity, an international team of researchers (France, Australia) has developed a new ultra-bright source of single photons—15 times brighter than commonly used sources and emitting photons that are 99.5% indistinguishable from one another. Adding an electrical control to the device helped reduce the “noise” around the quantum dot, which generally renders photons different from one another. The discovery could lead to optical and quantum computing. [TECHNICAL ARTICLE](#)

Tags: Photonics, Quantum science

QUANTUM SCIENCE

[A quantum computer based on five atoms](#)

[Nanowerk, 04MAR2016](#)

An international team of researchers (Austria, USA - MIT) report that they have designed and built a quantum computer from five atoms in an ion trap. The computer uses laser pulses to carry out Shor's algorithm on each atom to correctly factor the number 15. The system is designed in such a way that more atoms and lasers can be added to build a bigger and faster quantum computer, able to factor much larger numbers. The results represent the first scalable implementation of Shor's algorithm. [TECHNICAL ARTICLE](#)

Tags: Quantum science

S&T POLICY

[China's five year plan to 2020 is attempting to begin a shift from heavy industry to innovation driven development](#)

[Next Big Future, 08MAR2016](#)

China is attempting to decouple economic growth from energy consumption in [China's latest five year plan.](#) The new five-year plan includes \$23 billion in funding to give workers in older industries new skills suited to modern “sunrise” sectors such as information communication, new energy, new materials, aviation, biological medicine and intelligent manufacturing.

Tags: S&T policy, S&T China

SCIENCE WITHOUT BORDERS

[Trust your aha! moments: Experiments show they're probably right](#)

[Science Daily, 07MAR2016](#)

According to an international team of researchers (USA - Northwestern University, Rehabilitation Institute of Chicago, Drexel University, University of Wisconsin, Italy) conscious, analytic thinking can sometimes be rushed or sloppy, leading to mistakes while solving a problem. However, insight is unconscious and automatic—it can't be rushed. When the process runs to completion in its own time and all the dots are connected unconsciously, the solution pops into awareness as an Aha! moment. This means that when a really creative, breakthrough idea is needed, it's often best to wait for the insight rather than settling for an idea that resulted from analytical thinking.

[TECHNICAL ARTICLE](#)

Tags: Science without borders

SENSORS

[Novel whispering-gallery-type sensor for single nanoparticle detection](#)

[Nanowerk, 07MAR2016](#)

Ultrasensitive detection of nanoscale particles has applications in important fields ranging from environmental monitoring to analysis of viral structures. However, it remains extremely difficult due to ultralow polarizabilities of small-sized, low-index particles. An international team of researchers (China, South Korea) demonstrated that the dissipative interaction in a high-Q optical microcavity allows the detection of single nanoparticles. [TECHNICAL ARTICLE](#)

Tags: Sensors ■

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