



S&T NEWS BULLETIN

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FEATURE ARTICLES

[Self-assembling highly conductive plastic nanofibers](#)

[Science Daily, 22APR2012](#)

Researchers in France have succeeded in making highly conductive plastic fibers that are only several nanometers thick. These nanowires “self-assemble” when triggered by a flash of light. Their remarkable electrical properties are similar to those of metals. They are light and flexible like plastics, which opens up the possibility of meeting one of the most important challenges of 21st century electronics: miniaturizing components down to the nanometric scale.

Tags: Breakthrough technology, Advanced materials, Materials science, S&T France, Featured Article

The groundbreaking result sheds light on an elusive phenomenon whose existence, a natural outcome of the hundred-year-old theory of superconductivity, has long been speculated, but never actually observed.

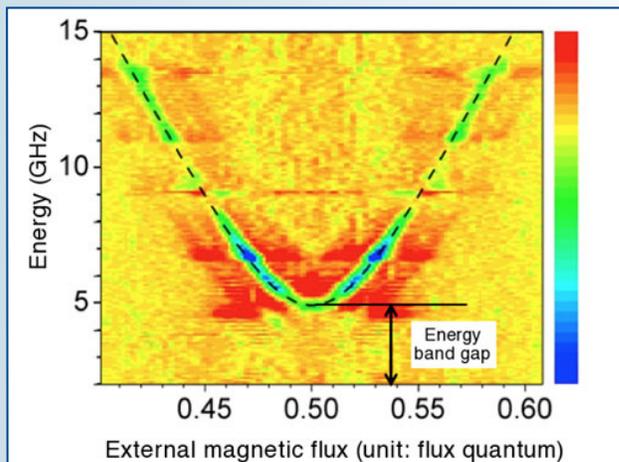
Tags: Quantum science, Breakthrough technology, Microelectronics, S&T Japan, Featured Article

[Rivers Flowing Into the Sea Offer Vast Potential as Electricity Source](#)

[Science Daily, 18APR2012](#)

Researchers explain that the little-known process, called pressure-retarded osmosis (PRO), exploits the salinity gradient between freshwater and seawater. In PRO, freshwater flows naturally by osmosis through a special membrane to dilute seawater on the other side. The pressure from the flow spins a turbine generator and produces electricity. The world’s first PRO prototype power plant was inaugurated in Norway in 2009.

Tags: Energy, Featured Article



Energy band gap obtained using energy spectroscopy. Existence of band gap establishes that coherent tunneling has occurred.

[A new kind of quantum junction](#)

[Nanowerk, 20APR2012](#)

A new type of quantum bit called a “phase-slip qubit”, devised by researchers at the RIKEN (Japan), has enabled the world’s first-ever experimental demonstration of coherent quantum phase slip (CQPS).

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

[Did Someone Order an Instant Bridge?](#)

[New York Times, 18APR2012](#)

Massachusetts officials once figured it would take two years to replace a dilapidated bridge. With new construction techniques, they got the job done over a long weekend. By using “accelerated bridge construction” techniques, a collection of technologies and methods that can shave months if not years off the process of building and replacing critical infrastructure, Massachusetts is at the forefront of a national effort that is aimed at putting drivers first.

Tags: Advanced manufacturing

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ADVANCED MATERIALS

IBM demonstrates graphene devices for terahertz waves

Nanowerk, 24APR2012

Graphene has been courted as the miracle material of the future, since different formulations have been fabricated into conductors, semiconductors and insulators. Now IBM has added photonic to the list by demonstrating a graphene/insulator superlattice that achieves a terahertz frequency notch filter and a linear polarizer, devices which could be useful in future mid- and far-infrared photonic devices, including detectors, modulators and three-dimensional metamaterials.

Tags: Advanced materials, Terahertz technology

Self-assembling nano boxes open the door to “smart” particles

Nanowerk, 23APR2012

At micro- and nanometer length scales three-dimensional (3-D) structures are too small to be assembled by any machine and they must be guided to assemble on their own. An interdisciplinary team of researchers in the US has led to a breakthrough showing that higher order polyhedra can indeed fold up and assemble themselves. What is remarkable here is not just that a structure folds up on its own, but that it folds into a very precise, three-dimensional shape, and it happens without any tweezers or human intervention.

Tags: Advanced materials

Forging ahead

The Economist, 21APR2012

American and European firms have sought salvation in high-end manufacturing from the onslaught of low-cost producers. That increasingly involves becoming more inventive with materials. This article will look at a number of such innovations, including the special casting system for the Rolls-Royce turbine blades as well as the use of carbon fibre, recycled plastic waste, new battery technology and others.

Tags: Advanced materials

Research team uses nanoparticles to make paper waterproof and magnetic

PhysOrg.com, 20APR2012

The process developed by researchers in Italy involves mixing superparamagnetic manganese ferrite colloidal nanoparticles with individual molecules or monomers that make up the cellulose fibers in paper products or other nonwoven materials and getting them to connect, forming polymers, by submersion in a liquid solution. This process causes a thin shell to form around each fiber. The result is a solution that when applied to paper produces a final product that is waterproof, magnetic, florescent or averse to bacteria.

Tags: Advanced materials

A guide to self-assembly

PhysOrg.com, 18APR2012

Proteins self-assemble. So do viruses less lethal than HIV. The trick is getting entropy to work for them. Entropy is a measure of disorder—the higher entropy, the more likely something will be ordered. Scientists at Harvard University have shown that polytetrahedrons have far greater vibrational entropy—24 times more—than octahedrons.

Tags: Advanced materials

Nanotechnology cotton opens up new possibilities for the fiber

Nanowerk, 18APR2012

Made of water-soluble polymers, 50- to 100-nanometer clay particles and other “green” ingredients, the experimental fabric treatment reacts to open flame by rapidly forming a swollen charred surface layer. This stops the flame from reaching underlying or adjacent fibers in a process known as “intumescence.”

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

More bounce to the ounce: Mini-robot attracts attention

PhysOrg.com, 20APR2012

The tiny device uses a pager motor to hop several feet in the air like a locust, then right itself after landing for another jump. Power comes from a small photo cell. The intent is to apply microfabrication technology to make it even smaller. Such tiny, mobile devices could be fitted with micro-sensors or communications networking equipment and deployed across rugged war zones or disaster areas.

Tags: Autonomous systems & robotics, Robotics

BIG DATA

New institute to tackle ‘data tsunami’ challenge

R&D Magazine, 19APR2012

Many simulations and experiments already generate petabytes of data—a single petabyte is 2,000 times more data than you can fit on a typical laptop—and they will soon be generating exabytes. The Department of Energy’s newly established Scalable Data Management, Analysis, and Visualization (SDAV) Institute is intended to help scientists deal with the deluge of data.

Tags: Big data, DOE, Government S&T

BIOTECHNOLOGY

Wearable muscle suit makes heavy lifting a cinch

KurzweilAI, 24APR2012

Scheduled for commercial release early next year, a wearable robot takes two forms: one augmenting the arms and

“The choice of technology, whether for a rich or a poor country, is probably the most important decision to be made.” **GEORGE MCROBIE**

back that is aimed at areas of commerce where heavy lifting is required; and a lighter, 5 kg version that will target the nursing industry to assist in lifting people in and out of bed, for example.

Tags: Biotechnology

Synthetic Genetic Evolution

The Scientist, 19APR2012

Scientists show that manmade nucleic acids can replicate and evolve, ushering in a new era in synthetic biology. Synthetic genetic polymers, broadly referred to as XNAs, can replicate and evolve just like their naturally occurring counterparts, DNA and RNA. The results of the research have implications not only for the fields of biotechnology and drug design, but also for research into the origins of life—on this planet and beyond.

Tags: Biotechnology, Synthetic biology

BREAKTHROUGH TECHNOLOGY

Quantum Rainbow Photon Gun Unveiled

MIT Technology Review, 24APR2012

One of the significant weaknesses of current quantum cryptographic systems is the finite possibility that today's lasers emit photons in bunches rather than one at a time. When this happens, an eavesdropper can use these extra photons to extract information about the data being transmitted. Researchers at Max Planck Institute have built a photon emitter with a range of properties that make it far more flexible, efficient and useful than any before—a kind of photon supergun **TECHNICAL ARTICLE**.

Tags: Breakthrough technology, Quantum science

COMMUNICATIONS TECHNOLOGY

Researchers boost efficiency of multi-hop wireless networks

KurzweilAI, 20APR2012

Multi-hop wireless networks utilize multiple wireless nodes to provide coverage to a large area by forwarding and receiving data wirelessly between the nodes. However, these networks have “hot spots”—places in the network where multiple wireless transmissions can interfere with each other. The researchers developed an approach called centrality-based power control which uses an algorithm that instructs each node in the network on how much power to use for each transmission depending on its final destination.

Tags: Communications Technology

COUNTER WMD

Defending against chemical acts of terrorism **e! Science News, 19APR2012**

Researchers are relying on the principles of evolution to produce a more efficient version of an enzyme that occurs naturally in all of us. Known as paraoxonase 1 (PON1), this enzyme was originally named for its ability to assist in the breakdown of the insecticide paraoxon.

Tags: Counter WMD

ENERGY

Scientists see solution to critical barrier to fusion

Science Daily, 24APR2012

DOE scientists zeroed in on tiny, bubble-like islands that appear in the hot plasmas. These minute islands collect impurities that cool the plasma. And it is these islands that are at the root of a long-standing problem known as the “density limit” that can prevent fusion reactors from operating at maximum efficiency. When you hit this magical density limit, the islands grow and coalesce and the plasma ends up in a disruption.

Tags: Energy, Nuclear energy

Shedding light on nature's nanoscale control of solar energy

Nanowerk, 19APR2012

The impact of this work is that it provides a clearer, more detailed picture of the first steps in photosynthetic energy conversion, identifies a role for delocalized excited-states, and provides new experimental and data analysis approaches for studying the unusual efficiency of light harvesting and charge separation processes in natural photosystems.

Tags: Energy, Solar energy

Wen to promote China's Arctic ambition in Europe

Terra Daily, 19APR2012

The Arctic and its vast energy reserves, one of the last places on earth where sovereignty has not been established, will be a key focus of Chinese Premier Wen Jiabao's trip to Europe. Iceland's strategic location near the Arctic has not gone unnoticed in China, the world's biggest energy consumer, as the shrinking of the polar ice cap makes the region's mineral resources more accessible.

Tags: Energy, S&T China

[Australian scientists report breakthrough in solar cell efficiency](#)

PhysOrg.com, 18APR2012

Using the upconversion technique, a process which harvests the part of the solar spectrum currently unused by solar cells, researchers in Australia are able to boost efficiency by forcing two energy-poor red photons in the cell to join and make one energy-rich yellow photon that can capture light, which is then turned into electricity.

Tags: Energy, S&T Australia, Solar energy

[Nature's Billion-year-old Battery Key to Storing Energy](#)

Science Newsline, 18APR2012

Researchers have been working with an enzyme found in bacteria that is crucial for capturing solar energy. Light induces a charge separation in the enzyme, causing one end to become negatively charged and the other positively charged, much like in a battery. In nature, the energy created is used immediately. To store that electrical potential, they added different molecules to alter the shape of the enzyme and, thus, extend the lifespan of its electrical potential.

Tags: Energy, Battery

FOREIGN S&T

[Chinese publishers vow to cleanse journals](#)

Nature News, 25APR2012

The country's roughly 5,300 home-grown journals have been a receptacle for much of the research that has resulted from misconduct. Two years ago, the government vowed to get rid of the most problematic publications (see *Nature*, 467, 261; 2010), but that weeding process hasn't happened yet.

Tags: Foreign S&T, Bibliometrics

IMAGING TECHNOLOGY

[Microscope captures nanoscale structures in dazzling 3D](#)

R&D Magazine, 18APR2012

Full field transmission x-ray microscope (TXM) provides the x-ray source needed to capture images on the nanoscale. The demonstrated success of the 3D imaging system has already attracted the interest of commercial users, with major corporations such as UOP and IBM scheduling time at the TXM. DARPA also plans to use the new microscope to probe the intricate structures of imported microchips in the interest of national security.

Tags: Imaging technology

INFORMATION TECHNOLOGY

[Military Explores Expansion of Open Source Technology](#)

Newsweek, 24APR2012

Open source technology can help military and other government entities modify software quickly. That flexibility, coupled with lower overall cost, is helping fuel a rapid increase in government adoption of open source software.

Tags: Information Technology, Government S&T

[TV as thin as a sheet of paper? Printable flexible electronics just became easier with stable electrodes](#)

Science Daily, 19APR2012

Researchers have introduced what appears to be a universal technique to reduce the work function of a conductor. Their use in printable electronics can pave the way for lower cost and more flexible devices.

Tags: Information Technology

MATERIALS SCIENCE

[First atomic-scale real-time movies of platinum nanocrystal growth in liquids](#)

Nanowerk, 19APR2012

In this first ever atomic-scale real-time movie of nanocrystal growth in liquid nanoparticles of platinum move

FEATURED RESOURCE

[MIT World](#)

Which ideas and innovations can change the world? MIT World™ answers that question by publishing key presentations by the MIT faculty and guest speakers who are shaping the future. These free, on-demand videos, are available 24/7 to viewers worldwide. More a publication of thought leadership, and less a news site, MIT World aims to capture the pulse and excitement of the range of ideas discussed at MIT every day. It contains more than 800 videos.

ENVIRONMENTAL SCIENCE

[Researchers develop method to fingerprint air pollution](#)

PhysOrg.com, 20APR2012

Pitt and EPRI researchers discovered that emissions from power plants employing the advanced NO_x controls had different proportions of the ¹⁵N atom in the NO_x they emitted. With this information, scientists will be able to analyze deposition samples and better determine the sources contributing to the deposited NO_x products.

Tags: Environmental science

and diffuse freely in liquid to coalesce into crystals along a specific direction. Faceting of the particles is also captured as they evolve into a crystalline shape. With this technique, movies can be made that provide unprecedented direct observations of physical, chemical and biological phenomena that take place in liquids on the nanometer scale. [VIDEO](#)

Tags: Materials science

[Microscopy yields first proof of ferroelectricity in simplest amino acid](#)

[Nanowerk, 19APR2012](#)

The boundary between electronics and biology is blurring with the first detection by researchers at Department of Energy's Oak Ridge National Laboratory of ferroelectric properties in an amino acid called glycine. The discovery of ferroelectricity opens new pathways to novel classes of bioelectronic logic and memory devices, where polarization switching is used to record and retrieve information in the form of ferroelectric domains.

Tags: Materials science

[Physicists observe the splitting of an electron inside a solid](#)

[Science Daily, 19APR2012](#)

An electron has been observed to decay into two separate parts, each carrying a particular property of the electron: a spinon carrying its spin—the property making the electron behave as a tiny compass needle—and an orbiton carrying its orbital moment—which arises from the electron's motion around the nucleus. These newly created particles, however, cannot leave the material in which they have been produced. Results may help to understand high-temperature superconductivity.

Tags: Materials science, S&T EU

MICROELECTRONICS

[Polarons in 2D](#)

[Nanowerk, 20APR2012](#)

Scientists in the US have discovered that the binary metal-oxide materials m-HfO₂ and m-ZrO₂ exhibit unexpected two-dimensional (2D) polaron behaviour. This discovery broadens the field of quasi-2D systems which often exhibit novel electronic properties. Polarons are quasiparticles comprised of a charge carrier.

Tags: Microelectronics, Advanced materials

[Nanodot-based memory sets new world speed record](#)

[Science Daily, 19APR2012](#)

Researchers have harnessed nanodots to create a new electronic memory technology that can write and erase data 10-100 times faster than today's mainstream charge-storage memory products. Each nanodot functions as a single memory bit. To control the memory operation, this layer is then covered with a thin metallic layer, which functions as a

"metal gate" which controls the "on" and "off" states of the transistor.

Tags: Microelectronics, Advanced materials, Nanomaterials

[New research could mean cellphones that can see through walls](#)

[Science Daily, 19APR2012](#)

Researchers at UT Dallas have designed an imager chip that could turn mobile phones into devices that can see through walls, wood, plastics, paper and other solid objects. The team's research linked two scientific advances. One involves tapping into an unused range in the electromagnetic spectrum. The other is a new microchip technology.

Tags: Microelectronics, Information technology

NEUROSCIENCE

[Speech lab: Unlocking the secrets of the human voice](#)

[BBC News, 24APR2012](#)

Speech or the human voice talking is comfortably the most complex sound you encounter on a day-to-day basis. Just by hearing a few words, you start to build up an image of what a person might be like. Our voices convey an awful lot of information about us, whether we want them to or not.

Tags: Neuroscience

[NIST Mini-sensor Measures Magnetic Activity in Human Brain](#)

[Science Newsline, 20APR2012](#)

A miniature atom-based magnetic sensor developed by NIST has passed an important research milestone by successfully measuring human brain activity. Experiments verify the sensor's potential for biomedical applications such as studying mental processes and advancing the understanding of neurological diseases.

Tags: Neuroscience, Government S&T

QUANTUM SCIENCE

[Photon Source May Facilitate Quantum Information Processing](#)

[Newswise, 19APR2012](#)

Using lasers to excite just one atom from a cloud of ultra-cold rubidium gas, physicists have developed a new way to rapidly and efficiently create single photons for potential use in optical quantum information processing - and in the study of dynamics and disorder in certain physical systems.

Tags: Quantum science, Communications Technology, Optical communication

[Raising the prospects for quantum levitation](#)

[Science Daily, 19APR2012](#)

More than half-a-century ago, the Dutch theoretical physicist Hendrik Casimir calculated that two mirrors placed facing each other in a vacuum would attract. The mysterious force arises from the energy of virtual particles flitting into

and out of existence, as described by quantum theory. Now a scientist in Japan, has predicted that in certain circumstances a reversal in the direction of the so-called Casimir force would be enough to levitate an extremely thin plate.

Tags: Quantum science

Elegant entanglement

Harvard University, 18APR2012

As a first step toward making parallel computations possible, researchers at Harvard University have established a new method for creating an entangled state between two qubits. By taking advantage of the electrostatic interaction between the particles, they were able to create pairs of qubits in a state that has no classical analog, known as an entangled state.

Tags: Quantum science

SENSORS

Iris recognition report evaluates ‘needle in haystack’ search capability

KurzweilAI, 19APR2012

NIST evaluated 92 different iris recognition algorithms from nine private companies and two university labs. The task was to identify individuals from a database of eye images taken from more than 2.2 million people. **REPORT**

Tags: Sensors, Biometrics

STEM

MIT launches student-produced educational video initiative

MIT News, 25APR2012

MIT has launched an initiative encouraging its students to produce short videos teaching basic concepts in science and engineering. The videos — aimed at younger students, in grades from kindergarten through high school — will be accessible through a dedicated MIT website and YouTube channel. A subset of the videos will also be available on Khan Academy, a popular not-for-profit educational site founded by an MIT alumnus. **MIT + K12 Making Video to Make a Difference**

Tags: STEM

Breakout Labs announce first grants to support radical innovation

KurzweilAI, 20APR2012

Six visionary teams are the first to receive funding from Breakout Labs, a Thiel Foundation program to support radical scientific innovation. The projects involve digital brain reconstruction, reversible cryopreservation, human cell re-engineering, universal airborne contaminant detection, artificial protein therapeutics, and antimatter-based fuel.

Tags: STEM

SDSC Announces ‘Center of Excellence’ for Predictive Analytics

Newswise, 18APR2012

The San Diego Supercomputer Center (SDSC) at the University of California, San Diego is launching a new “center of excellence” aimed at leveraging SDSC’s data-intensive expertise and resources to help create the next generation of data researchers by leading a collaborative, nationwide education and training effort among academia, industry, and government.

Tags: STEM, S&T Policy ■

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