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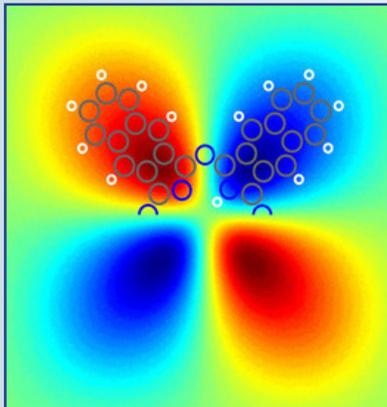
FEATURE ARTICLES

[Can The Human Brain See Quantum Images?](#)

MIT Technology Review, 28FEB2012

Researchers at Northwestern University in Evanston, Illinois, ask whether it is possible for humans to see higher order images and suggest that a relatively simple experiment could settle the question. The experiment consists of a laser beam shaped into an image, such as the letter A. The laser then hits a non-linear crystal, generating entangled pairs of photons that retain this image shape. The set up is such that these photons are then detected, not by conventional detectors, but by human eyeballs. **TECHNICAL ARTICLE**

Tags: Quantum science, Neuroscience, Featured Article



IBM captures image of electric charge in motion Density-functional theory calculation of the asymmetry of the electric field above a free naphthalocyanine molecule at a distance $d = 0.5$ nanometers from the molecular plane. Image by IBM Research

[Nanophysics breakthrough captures first-ever image of charge distribution in a single molecule](#)

IBM Zurich, 27FEB2012

This breakthrough by IBM scientists will enable fundamental scientific insights into single-molecule switching and bond formation between atoms and

molecules. The ability to image the charge distribution within functional molecular structures holds great promise for future applications such as solar photo-conversion, energy storage, or molecular scale computing devices.

Tags: Breakthrough technology, Featured Article

S&T NEWS ARTICLES

ADVANCED MATERIALS

[10 years of nanotechnology risk research—a European status update](#)

Nanowerk, 28FEB2012

A group of experts from the chemical industry and various research laboratories in Germany have published a report on the current status of risk research on nanotechnology materials and applications. The report—10 Years of Research: Risk Assessment, Human and Environmental Toxicology of Nanomaterials—provides an overview of the current state of risk assessment and toxicological research into nanomaterials.

Tags: Advanced materials, Nanomaterials, Nanotechnology

[Two molecules communicate via single photons](#)

Nanowerk, 27FEB2012

Scientists realize one of the most elementary and oldest “Gedanken” experiments in modern physics, namely, excitation of a single molecule with a single photon. This paves the way for further investigations in which single photons act as carriers of quantum information to be processed by single emitters.

Tags: Advanced materials, Nanotechnology

[‘Negative refraction’ opens avenue to new products and industries](#)

PhysOrg.com, 23FEB2012

The new approach uses ultra-thin, ultra-smooth, all-amorphous laminates, essentially a layered glass that has no crystal structure. It is, the researchers say, a “very high-tech sandwich.” The goal is to make radiation bend opposite to the way it does when passing through any naturally occurring material. This is possible in theory, as Maxwell penciled out during the American Civil War. In reality, it’s been pretty difficult to do.

Tags: Advanced materials

[A new twist on nanowires](#)

EurekaAlert, 22FEB2012

A team of MIT researchers has found a way of precisely controlling the width and composition of these tiny strands as they grow, making it possible to grow complex structures

continued...

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that are optimally designed for particular applications. Nanowires are grown by using “seed” particles, metal nanoparticles that determine the size and composition of the nanowire. By adjusting the amount of gases used in growing the nanowires, researchers were able to control the size and composition of the seed particles and, therefore, the nanowires as they grew.

Tags: Advanced materials, Nanomaterials

BIOTECHNOLOGY

New ‘magnetic yeast’ marks step toward harnessing Nature’s magnetic capabilities

[EurekaAlert](#), 28FEB2012

Researchers at Harvard have developed a method for inducing magnetic sensitivity in an organism that is not naturally magnetic -- yeast. Their technology could potentially be used to magnetize a variety of different cell types in medical, industrial and research applications.

Tags: Biotechnology, Biology, Medical Sciences, Medical technology

COMMUNICATIONS TECHNOLOGY

Wireless Spectrum Deal Could Unleash Super Wi-Fi

[MIT Technology Review](#), 23FEB2012

The FCC will sell off unused TV spectrum, lower frequencies—previously set aside for analog TV broadcasts—that allow for longer-range, higher-capacity communications. But making use of the frequencies will require technology capable of flitting rapidly between different frequencies at high speed. At the simplest level, the move could stave off a growing wireless overload. Mobile data usage worldwide is expected to grow 18-fold over the next five years.

Tags: Communications Technology

ENERGY

Mechanism behind capacitor’s high-speed energy storage discovered

[R&D Magazine](#), 23FEB2012

According to researchers at the North Carolina State university, capacitors which contained the polymer PVDF in combination with another polymer called CTFE were able to store up to seven times more energy than those currently in use. Usually when materials change from a polar to non-polar state it’s a chain reaction. In the case of the PVDF mixture, the atoms change their state all at once, which means that you get a large amount of energy out of the system at very little cost in terms of what you need to put into it.

Tags: Energy, Alternate energy, Battery

Fiber Optic connection to computer screen will save 30% of energy

[Next Big Future](#), 22FEB2012

With LED, which is currently used, 60% of the light remains trapped inside the diodes and accounts for a significant loss in efficiency. The fiber optics developed by L.E.S.S. could bring just as much luminosity and contrast while conserving a quarter of the energy. That liberated power could be used by the processor to gain speed.

Tags: Energy, Information technology

ENVIRONMENTAL SCIENCE

Rain drains energy from the atmosphere

[Physics World](#), 24FEB2012

Researchers in the US have shown that the energy lost as heat by falling liquid water and ice particles is on par with the energy that the wind loses to friction. The team suggests that with the increasing precipitation expected as a result of global warming, the energy sunk into rainfall could reduce the amount available to generate winds.

Tags: Environmental science, Climatology

FOREIGN S&T

Initial results from first large-scale science collaboration between China and Germany

[Nanowerk](#), 23FEB2012

TRR 61, or the Transregional Collaborative Research Center was established in 2008 and supports about 150 research staff in Muenster and Beijing. Examples of the top-quality research from the first phase of the project have been collected together in a special issue of the Wiley-VCH Journal *Small* which deals with micrometer-sized materials.

Tags: Foreign S&T, S&T China, S&T Germany

IMAGING TECHNOLOGY

Laser radar illuminates the way to deep space

[PhysOrg.com](#), 23FEB2012

For missions deeper into our Solar System, ESA hopes to use 3D imaging lidar to build up a complete picture of targets such as a boulder-strewn surface. This would be like a stereoscopic imager, but it would also work in total darkness or blinding sunlight. The shoebox-sized imaging lidars rely on a steerable scan mirror that flicks the laser beam across the target, with a highly sensitive light detector capable of measuring the returning beams from up to several kilometres away.

Tags: Imaging technology, Science without borders, Space technology

“The difficulty lies, not in the new ideas,
but in escaping the old ones.” JOHN MAYNARD KEYNES

INFORMATION TECHNOLOGY

Future smart phones will project images on the wall

EurekAlert, 28FEB2012

Researchers in Finland are developing a better laser light source for projectors that will be integrated into mobile phones, which will enable accurate and efficient projection of photographs and movies on any surface. Integrated micro projectors could, in practice, project images the size of an A3 sheet of paper on a wall.

Tags: Information Technology, Foreign S&T

MATERIALS SCIENCE

A study describes liquid water diffusion at molecular level

PhysOrg.com, 24FEB2012

Liquid water exhibits up to 65 abnormalities. Particularly confusing are the results on the diffusion of water confined between two hydrophobic plates. It seems that the mobility of water molecules relies on ducts having a diameter above or below 1nm. Spanish researchers work might lead to a revolutionary change in water desalination and filtration methods.

Tags: Materials science

Physicists find new path toward increasing semiconductor functionality

PhysOrg.com, 24FEB2012

An international team of researchers has succeeded in identifying the mechanisms responsible for ferromagnetism in the semiconductor (Ga,Mn)As. This new understanding provides a handle for planning new strategies aimed at increasing the alloy's critical temperature, making it ferromagnetic at and above room temperature, and thus opening the way toward realistic spintronic devices.

Tags: Materials science, Semiconductors

A Leap Forward for Plastic Solar Cells

MIT Technology Review, 23FEB2012

A record-breaking polymer solar cell made by researchers at UCLA converts 10.6 percent of the energy in sunlight into electricity. The new plastic solar cell combines two layers that work with different bands of light, visible light and infrared light. Matching the electrical properties of each layer and connecting them together is challenging. Polymers can be printed from solution, like printing ink on paper, which is both a primary advantage of the technology and a liability.

Tags: Materials science, Solar energy

Discovery opens door to low-cost 'negative refraction,' new products and industries

EurekAlert, 23FEB2012

The new approach uses ultra-thin, ultra-smooth, all-amorphous laminates, essentially a layered glass that has no crystal structure. It is, the researchers say, a "very high-tech sandwich." The goal is to make radiation bend opposite to the way it does when passing through any naturally occurring material. This is possible in theory. In reality, it's been pretty difficult to do.

Tags: Materials science, Advanced materials, Metamaterials

Making droplets drop faster

MIT News, 23FEB2012

The condensation of water is crucial to the operation of most of the powerplants that provide our electricity. New research by a team at MIT offers important new insights into how these droplets form, and ways to pattern the collecting surfaces at the nanoscale to encourage droplets to form more rapidly. These insights could enable a new generation of significantly more efficient powerplants and desalination plants, the researchers say. VIDEO

Tags: Materials science, Science without borders

Superconductor breaks high-temperature record

Nature News, 22FEB2012

Under normal pressure, iron selenide superconducts up to about 30 K. A team of researchers in China squeezed a single crystal of the material, measuring 100 micrometres in diameter and 50 micrometres thick, between two diamond-tipped anvils. At first superconductivity stopped as the pressure approached 10 gigapascals. But as they increased the pressure above 11.5 GPa the sample began to superconduct again. A physicist at Harvard University says that the bizarre re-emergence effect may be related to the way that 'vacancies' — sites in the crystal that don't have any ions — are shuffled around when pressure is applied.

Tags: Materials science

NEUROSCIENCE

How to Control a Prosthesis With Your Mind

IEEE Spectrum, 27FEB2012

New brain-machine interfaces that exploit the plasticity of the brain may allow people to control prosthetic devices in a natural way. Researchers at University of California, Berkeley suggest that to operate a robotic arm you may not need to use the cortical map that controls a person's arm. Because that person's brain is apparently capable of developing a dedicated neural circuit, called a motor memory,

for controlling a virtual device or robotic arm in a manner similar to the way it creates such memories for countless other movements and activities in life.

Tags: Neuroscience, Biology, Medical Sciences

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PHOTONICS

[NTT researchers develop breakthrough optical memory device](#)

[PhysOrg.com](#), 27FEB2012

The new memory device created by the NTT team relies on optical cavities that are created in a material that can be made to represent 1s and 0s by either transmitting light, or by blocking it. To make the memory cell, the team buried a very tiny strip of indium gallium arsenide phosphide in a small piece of indium phosphide. The outer portion was then etched with holes small enough to control the flow of laser light of a certain frequency. They left a path running through the middle of the material un-etched to provide a means for light from a laser to move in and out of the cell.

Tags: Photonics, Information technology

[Transforming computers of the future with optical interconnects](#)

[PhysOrg.com](#), 23FEB2012

The ability to manufacture photonic interconnect components—modulators, detectors, waveguides, and filters—on silicon substrates has finally been realized, and these optical interconnect structures show great potential for intrachip and interchip applications. HP Labs is studying how this shift to light-based interconnects may revolutionize the way computers are built.

Tags: Photonics, Information technology

QUANTUM SCIENCE

[Scientists Score New Victory Over Quantum Uncertainty](#)

[Newswise](#), 26FEB2012

Physicists at the Georgia Institute of Technology report squeezing a property called the nematic tensor, which is used to describe the rubidium atoms in Bose-Einstein condensates. Over the past few decades, scientists have learned to cheat a bit on the Uncertainty Principle through

a process called “squeezing,” which has the effect of changing how the uncertainty is shown graphically. For the military, squeezing more accuracy could improve the detection of enemy submarines attempting to hide underwater or improve the accuracy of atom-based inertial guidance instruments.

Tags: Quantum science

[Quantum Computing—An uncertain future](#)

[The Economist](#), 25FEB2012

Researchers are a long way from creating quantum mainframes, which is how most of them see the future of their fiddly devices, let alone quantum desktops. Dr. Martinis thinks that a viable quantum processor is still ten years away. Yet even this is progress of a sort. When he entered the field two decades ago, he thought that building a quantum processor was “insanely difficult”. Now he says it is merely “very, very hard”.

Tags: Quantum science

S&T POLICY

[Competitiveness Council: Innovation ministers discuss ins and outs of Horizon 2020](#)

[EU R&D News](#), [Cordis](#), 22FEB2012

The Commission’s draft plan states that the EUR 80 million Horizon 2020 budget will focus on supporting excellence in the science base, tackling societal challenges and securing industrial leadership and competitive frameworks. [Horizon 2020](#).

Tags: S&T policy, S&T EU

[Europe plans exascale funding above US levels](#)

[KurzweilAI](#), 22FEB2012

The European Commission last week said it is doubling its investment in the push for exascale computing from [Euro]630 million to [Euro]1.2 billion (or the equivalent of \$1.58 billion), the same week the White House released its fiscal year 2013 budget, which envisions a third year of anemic funding to develop exascale technologies. Meanwhile, China is moving ahead with its own plans and has the financial resources and human talent to make progress in exascale computing.

Tags: S&T policy, R&D Funding, S&T China, S&T EU

SCIENCE WITHOUT BORDERS

[Augmented-reality rope lets you team up to fly a kite](#)

[KurzweilAI](#), 28FEB2012

A new game called Rope Revolution developed by graduate students at MIT uses an augmented-reality rope to allow players to fly a kite, ride a horse, or skip with a partner across the globe. The rope controller recognizes various gestures, using a sensor in the wall attachment and an accelerometer built into the rope handle. [VIDEO](#)

Tags: Science without borders

Mysterious electron acceleration explained[PhysOrg.com, 27FEB2012](#)

A mysterious phenomenon detected by space probes has finally been explained, thanks to a massive computer simulation that was able to precisely align with details of spacecraft observations. The finding could not only solve an astrophysical puzzle, but might also lead to a better ability to predict high-energy electron streams in space that could damage satellites.

Tags: Science without borders, Space technology

“Emerge 2012” attracts futurists to collaborate with scientists, designers artists in redesign of future[EurekaAlert, 24FEB2012](#)

Singular questions about what it means to be human in the face of emerging technologies will be explored March 1-3 when Arizona State University hosts Emerge. An unparalleled campus-wide collaboration, Emerge unites artists, engineers, bio scientists, social scientists, story tellers and designers to build, draw, write and rethink the future of the human species and the environments that we share.

[Conference website](#)

Tags: Science without borders

A Faster Fast Fourier Transform[IEEE Spectrum, 24FEB2012](#)

The newest MIT algorithm beats the traditional FFT so long as the number of frequency components present is a single-digit percentage of the number of samples you take of the signal. It works for any signal, but it works faster than the FFT for “sparse” signals, that contain a relatively small number of frequency components of significant size.

Tags: Science without borders

Higgs in rare interview about boson (video)[BBC, 24FEB2012](#)

One of the world’s most influential physicists, Professor Peter Higgs, who rarely gives interviews, has spoken to the BBC about his achievements. His work on the existence of the so-called God particle began in the 1960s.

Tags: Science without borders

Researchers aim to chart intellectual trends in Arxiv[Nature News, 24FEB2012](#)

Researchers from Harvard University want to break down the full text of the articles into component phrases to see how often a particular word or phrase appears relative to others. Their goals: to give Arxiv a new tool for identifying original source papers in physics, mathematics and computer science. It can help the reader figure out where in time the most relevant papers were located, which has always been difficult to do.

Tags: Science without borders, Biometrics

Aircraft of the future could capture and re-use their own power[R&D Magazine, 23FEB2012](#)

The energy produced by a plane’s braking system during landing—currently wasted as heat produced by friction in the aircraft’s disc brakes—would be captured and converted into electricity by motor-generators built into the landing gear. The electricity would then be stored and supplied to the in-hub motors in the wheels of the plane when it is needed to taxi. ‘Engine-less taxiing’ could therefore become a reality. This would save on aviation fuel, cut emissions, and reduce noise pollution at airports.

Tags: Science without borders, Energy

LCD Pioneers Honored with Draper Prize[IEEE Spectrum, 23FEB2012](#)

NAE president Charles M. Vest presented the Charles Stark Draper Prize to George H. Heilmeier, Wolfgang Helfrich, Martin Schadt, and T. Peter Brody. Sometimes referred to as “the Nobel Prize of engineering,” the Draper Prize, named in honor of the M.I.T. professor who perfected the inertial navigation systems utilized in the Apollo missions, is a \$500,000 annual award that recognizes engineers whose accomplishments “have led to important benefits and significant improvement in the well-being and freedom of humanity.” [Heilmeier’s Catechism](#)

Tags: Science without borders

Flaws found in faster-than-light neutrino measurement[Nature News, 22FEB2012](#)

Two possible sources of error uncovered. As many physicists had speculated might be the case, both are related to the experiment’s pioneering use of Global Positioning System (GPS) signals to synchronize atomic clocks at each end of its neutrino beam. First, the passage of time on the clocks between the arrival of the synchronizing signal has to be interpolated and OPERA now says this may not have been done correctly. Second, there was a possible faulty connection between the GPS signal and the OPERA master clock.

Tags: Science without borders

Space elevator by 2050 planned, to include space solar power[KurzweilAI, 22FEB2012](#)

Obayashi Corp. has unveiled a project to build a space elevator by the year 2050 that would transport passengers to a station 36,000 kilometers above the Earth and transmit power to the ground. A cable, made of carbon nanotubes, would be stretched up to 96,000 kilometers. One end of the cable would be anchored at a spaceport on the ground, while the other would be fitted with a counterweight. The terminal station would house laboratories and living space. The elevator car could carry 30 people to the station, a 7-1/2 day trip.

Tags: Science without borders, S&T Japan

continued...

The man behind the machine

Nature News, 22FEB2012

Alan Turing is famous for many reasons. Andrew Hodges delves into why Turing's achievements took so long to be recognized. Now it was clear why he had emerged as a computer builder in 1945—he had gained experience he could never reveal. By the 1970s, there was also more room for his vision of computation.

Tags: Science without borders

SENSORS

Finding explosives with laser beams

PhysOrg.com, 27FEB2012

Using Raman scattering, scientists at Vienna University of Technology have found a way to detect chemicals at a distance of more than a hundred meters even if they are enclosed in containers. Among hundreds of millions of photons, only a few trigger a Raman-scattering process in the sample. Only a tiny fraction travel back to the light detector. From this very weak signal as much information as possible has to be extracted. This can be done using a highly efficient telescope and extremely sensitive light detectors.

Tags: Sensors, Explosives ■

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