



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[Hot plasma core, cold edge: A masterpiece of control technique](#)

[Science Daily, 23OCT2012](#)

A world record in heating power, in relation to the size of the device, has been achieved by the ASDEX Upgrade fusion device at Max Planck Institute, Germany. For the first time world-wide, a fast feedback control facility ensures, on the one hand, that the millions of degrees hot high-power plasmas needed are produced and, on the other, that the wall of the plasma vessel is not overloaded, this being an important result on the way to a fusion power plant.

Tags: Breakthrough technology, Energy, Nuclear energy, Featured Article

[Explainer: what is 3D printing and what's it for?](#)

[The Conversation, 22OCT2012](#)

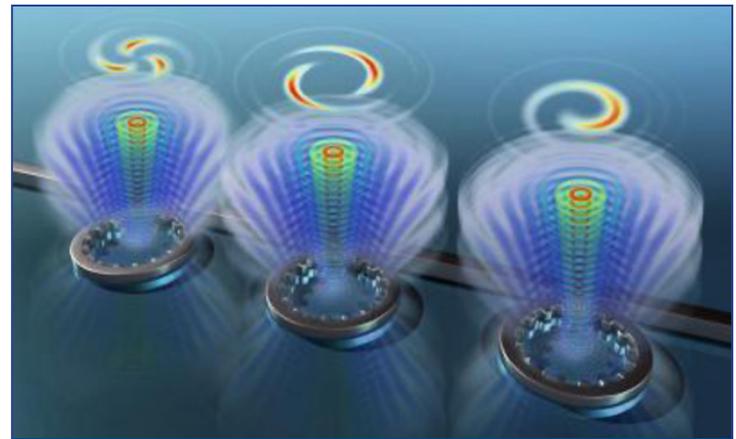
In recent years, the technology has been used to make medical parts including custom hearing aids and braces. The method has also been used to reproduce body parts, including ears, hips and even organs, in exact proportions to fit the patient. This may potentially eliminate the need for organ donors and provide doctors with on-demand human tissue. In a world's first, in February 2012, surgeons successfully implanted an entire titanium jaw, made with 3D printing, in an elderly woman. [VIDEO](#)

Tags: Advanced manufacturing, Featured Article

[Optical vortices on a chip: Integrated arrays of emitters of 'optical vortex beams' on a silicon chip](#)

[Science Daily, 22OCT2012](#)

Contradicting traditional conception, light beams do not propagate in straight rays. Instead, its energy travels in a spiral fashion in a hollow conical beam shape. The beams therefore look very much like a



This is an illustration of an array consisting of three identical emitters. The three-dimensional emission pattern is calculated with the use of a dipole-emission-based semianalytical model. (Credit: Image by Miss Yue Zhang)

vortex or cyclone, with its light rays 'twisted' either left-handed or right-handed. In theory, there is no limit to how twisted the light rays can be. [TECHNICAL ARTICLE](#)

Tags: Breakthrough technology, Materials science, Featured Article

S&T NEWS ARTICLES

ADVANCED MATERIALS

[Nanomaterials: Bringing crystals into line](#) [Nanowerk, 24OCT2012](#)

Unlike bulk materials, cobalt phosphide nanowires consist of single-domain structures that account for their superparamagnetism—a temperature-induced magnetism that arises in a magnetic field. To maintain and fully exploit this behavior, scientists in Singapore have developed a method that uses temperature changes to align individual nanowires to precisely position and orient building blocks. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

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Obstinate electrons ‘ignore’ assumptions and follow another path

Science Daily, 24OCT2012

The nanowires, which have a cross-sectional area of no more than one square nanometer are attached to a substrate made of the semiconductor germanium. The virtually defect-free nanowires are spaced at intervals of just 1.6 nanometers. This forces electrons to adopt one-dimensional behavior. [TECHNICAL ARTICLE](#)

Tags: *Advanced materials*

Scientists build ‘mechanically active’ DNA material

Nanowerk, 24OCT2012

Researchers at UC Santa Barbara have created a dynamic gel made of DNA that mechanically responds to stimuli in much the same way that cells do. Their DNA gel, at only 10 microns in width, is roughly the size of a eukaryotic cell, the type of cell of which humans are made. The miniscule gel contains within it stiff DNA nanotubes linked together by longer, flexible DNA strands that serve as the substrate for molecular motors. [TECHNICAL ARTICLE](#)

Tags: *Advanced materials, Materials science*

Tiny pores in graphene could give rise to membranes

MIT News, 23OCT2012

Graphene may not be as impenetrable as scientists have thought. By engineering relatively large membranes from single sheets of graphene grown by chemical vapor deposition, researchers in US and elsewhere have found that the material bears intrinsic defects, or holes in its atom-sized armor. Their findings point not to a flaw in graphene, but to the possibility of promising applications, such as membranes that filter microscopic contaminants from water, or that separate specific types of molecules from biological samples. [TECHNICAL ARTICLE](#)

Tags: *Advanced materials*

Towards smart plasmonics

Nanowerk Spotlight, 22OCT2012

By exploiting the outstanding properties of self-organizing materials, a team of Italian scientists has investigated a new way to build a bridge between two branches of physics: ‘hard matter’ and ‘soft matter’. This allows researchers to address specific issues towards the realization of active-plasmonics devices, where the plasmonic resonance of gold nanoparticles can be finely controlled by means of external perturbations (electrical field, optical field, temperature). [TECHNICAL ARTICLE](#)

Tags: *Advanced materials*

AUTONOMOUS SYSTEMS & ROBOTICS

Robots that perceive the world like humans

Science Daily, 22OCT2012

Perceive first, act afterwards. The architecture of most of today’s robots is underpinned by this control strategy.

Researchers in Spain are working on changing the paradigm and generating more dynamic computer models in which action is not a mere consequence of perception but an integral part of the perception process. It is about improving robot behavior by means of perception models closer to those of humans.

Tags: *Autonomous systems & robotics*

Scientists to research robots of the future

Science Daily, 22OCT2012

Inspired by squishy, flexible creatures like the common caterpillar, researchers will develop soft-bodied robots that will be continuously deformable and capable of crumpling into small volumes. They will have capabilities that are not currently available in conventional robots.

Tags: *Autonomous systems & robotics*

Video Friday: Catching Up

IEEE Spectrum, 22OCT2012

You may have spotted Nimbro-OP in our IROS expo gallery; it’s the new humanoid TeenSize open platform from the University of Bonn.

Tags: *Autonomous systems & robotics*

BIG DATA

Big Data Tackles Classic Question: What’s The Weather Forecast?

Information Week, 23OCT2012

TempRisk application developed by EarthRisks Technologies in California uses statistical methods to study decades of weather data to uncover key patterns, and then applies these patterns to current atmospheric conditions. It can predict extreme weather conditions, such as severe winter cold spells and searing summer heat, up to 40 days in advance with a 70% accuracy rate.

Tags: *Big data, Climatology*

IBM Accelerates Big Data Analysis

Information Week, 23OCT2012

IBM offers prebuilt sentiment analysis on Hadoop, stream processing for telcos, marketing analysis, and predictive analytics delivered via the cloud.

Tags: *Big data, Information technology*

BIOTECHNOLOGY

Viruses act like ‘self-packing suitcases’

e! Science News, 19OCT2012

Researchers at the University of Leeds have identified a crucial stage in the lifecycle of simple viruses like polio and the common cold that could open a new front in the war on viral disease.

Tags: *Biotechnology, Biology*

“The whole of science is nothing more than a refinement of everyday thinking.”

ALBERT EINSTEIN

COMMUNICATIONS TECHNOLOGY

[A Bandwidth Breakthrough](#)

[MIT Technology Review](#), 23OCT2012

Academic researchers have improved wireless bandwidth by an order of magnitude—not by adding base stations, tapping more spectrum, or cranking up transmitter wattage, but by using algebra to eliminate the network-clogging task of resending dropped packets of data.

Tags: Communications Technology

[Japan gets phone call translator](#)

[BBC News](#), 22OCT2012

An app offering real-time translations is to allow people in Japan to speak to foreigners over the phone with both parties using their native tongue. The products have the potential to let companies avoid having to use specially trained multilingual staff, helping them cut costs. They could also aid tourism. However, the software involved cannot offer perfect translations, limiting its use in some situations.

Tags: Communications Technology

ENERGY

[Nature inspires research to convert solar into liquid fuel](#)

[PhysOrg.com](#), 23OCT2012

It has long been a dream of scientists to use solar energy to produce chemicals which could be stored and later used to create electricity or fuels. In the laboratory, a new technology mimics photosynthesis, the process used by plants, by combining sunlight and water in such a way that promises storable fuels.

Tags: Energy

ENVIRONMENTAL SCIENCE

[Offsetting global warming: Targeting solar geoengineering to minimize risk and inequality](#)

[Science Daily](#), 22OCT2012

A new study suggests that solar geoengineering can be tailored to reduce inequality or to manage specific risks like the loss of Arctic sea ice. By tailoring geoengineering efforts by region and by need, a new model promises to maximize the effectiveness of solar radiation management while mitigating its potential side effects and risks.

TECHNICAL ARTICLE

Tags: Environmental science

FORECASTING

[2012 State of the Future](#)

[KurzweilAI](#), 24OCT2012

The report is a distillation of research, including tables, graphs, and charts with special chapters on [15 Global](#)

[Challenges](#), the State of the Future Index, changing stereotypes about women around the world over the past 50 years and projected next 50 years, future factors affecting cooperatives and businesses, and futures of ontologists.

REPORT

Tags: Forecasting

GOVERNMENT S&T

[Nasa to develop service stations for satellites](#)

[Wired UK](#), 22OCT2012

Engineers at Nasa's Kennedy Space Center in Florida are assisting the space agency's Goddard Space Flight Center in developing the concept for bringing a high-technology gas pump, robotic mechanic and tow trucks for satellites in space, which would be able to repair satellites in geosynchronous orbit.

Tags: Government S&T, NASA, Space technology

INFORMATION TECHNOLOGY

[Microsoft's Plan to Bring About the Era of Gesture Control](#)

[MIT Technology Review](#), 22OCT2012

The goal of the program called Kinect for Windows is to allow computers to be used in new ways—for example, by surgeons who don't want to touch a keyboard with sterilized hands midway through surgery. A Kinect unit uses infrared and conventional cameras to track gestures and a microphone to take voice input.

Tags: Information Technology

MATERIALS SCIENCE

[Infrared absorption boosted by layering sheets of graphene](#)

[Nanowerk](#), 23OCT2012

When sheets of graphene are stacked, the resulting “few-layer graphene” can either function as a semi-metal or a semi-conductor, depending on the order and thickness of the layers. This is because changes in stacking order alter the amount of available states for electrons to inhabit both at rest and when they're excited after absorbing infrared light. A team of researchers in the US found that phonons are also affected by the stacking arrangement due to their strong connection with the electronic excitations. When the electronic absorption grows, the phonon absorption grows too. **TECHNICAL ARTICLE**

Tags: Materials science, Advanced materials

continued...

Finding Ferroelectrics—Synopsis**American Institute of Physics, 22OCT2012**

Any insulating material with a polar structure can, in principle, be ferroelectric if the energy barrier for switching electric polarization is low enough. Following this idea, researchers at Rutgers's university decided to study compounds of the LiGaGe structure type—a hexagonal structure that is “stuffed” with a cation lying between atomic planes. [TECHNICAL ARTICLE](#)

*Tags: Materials science***Negative friction surprises researchers****Physics World, 22OCT2012**

Researchers in the US and China have shown that if you press the tip of an atomic-force-microscope on a graphite surface, friction decreases the harder you push. Nanotribology is becoming increasingly important as scientists and engineers develop tiny nanomachines for a range of potential applications from assembling circuits to targeted drug delivery.

*Tags: Materials science, Advanced materials***FEATURED RESOURCE****arXiv**

arXiv, started in 1994, is an e-print service in the fields of physics, mathematics, non-linear science, computer science, quantitative biology, quantitative finance and statistics. arXiv is owned and operated by Cornell University, funded by Cornell University Library and supporting user institutions. [RSS](#)

MICROELECTRONICS**New finding could pave way to faster, smaller electronics****Science Daily, 23OCT2012**

Understanding the magnetic behavior of atoms is key to designing spintronics materials that could operate at room temperature, an essential property for applications. Researchers, for the first time, have looked inside gallium manganese arsenide that could open up an entirely new class of faster, smaller devices based on spintronics.

[TECHNICAL ARTICLE](#)*Tags: Microelectronics, Advanced materials***NEUROSCIENCE****How the Brain Forms Categories****Newswise, 22OCT2012**

Neurobiologists in Vienna found that the brain's ability to group external stimuli into stable categories is in the discrete dynamics of neuronal circuits. They demonstrated

that discrete network states provide a substrate for category formation in brain circuits. The authors suggest that the hierarchical structure of discrete representations might be essential for elaborate cognitive functions such as language processing.

*Tags: Neuroscience***QUANTUM SCIENCE****Quantum computing with recycled particles****Science Daily, 23OCT2012**

Using photons as the particles, the University of Bristol (UK) team constructed a quantum optical circuit that recycled one of the photons to set a new record for factoring 21 with a quantum algorithm—all previous demonstrations have factored 15. [TECHNICAL ARTICLE](#)

*Tags: Quantum science, S&T UK***Breakthrough offers new route to large-scale quantum computing****Science Daily, 22OCT2012**

In a key step toward creating a working quantum computer, researchers have developed a method that may allow the quick and reliable transfer of quantum information throughout a computing device. A team of researchers in the US combined techniques from two branches of science: from materials science, they used a quantum dot to hold and analyze electrons' spins; and from optics, they adopted a microwave channel to transfer the spin information from the dot. [TECHNICAL ARTICLE](#)

*Tags: Quantum science***S&T POLICY****Broadening the frontiers of brain research: The Research Resources Center****RIKEN Research, 19OCT2012**

The RRC (Research Resources Center) can be described as a technical support organization where all techniques and research materials needed for brain research are available at levels of unified activities that lead the world. In February 2011, the Neural Circuit Genetics Research Building, equipped with new animal facilities, went into operation. With the availability of these new facilities, and the center's other key resources, the RRC serves as a foundation which further advances the BSI's research strength. [BSI](#)

Tags: S&T policy, S&T Japan

SCIENCE WITHOUT BORDERS

Satellites track rapid changes in the Earth's core

R&D Magazine, 23OCT2012

Changes in the earth's magnetic field in a region that stretches from the Atlantic to the Indian Ocean have a close relationship with variations of gravity in this area. Because geophysicists can follow these changes using highly accurate measurements from certain satellites, they can make conclusions about what is happening in the Earth's outer core. [TECHNICAL ARTICLE](#)

Tags: Science without borders

Zeroing in on the 'science of sound propagation' in burning buildings

Science Daily, 23OCT2012

An acoustic navigation system being developed by a team of researchers studying the science of sound propagation inside burning buildings may one day become a life-saving addition to firefighters' arsenal of tools.

Tags: Science without borders

Winners of the 2011 Feynman Prizes in nanotechnology

KurzweilAI, 22OCT2012

The winner of the 2011 Feynman Prize for Experimental work is Leonhard Grill (Fritz Haber Institute, Max Planck Research School, Germany) in recognition of his pioneering and continuing work on manipulating and structuring functional matter at the atomic scale.

Tags: Science without borders

World's most advanced mirror for giant telescope completed

PhysOrg.com, 22OCT2012

Scientists at the University of Arizona and California have completed the most challenging large astronomical mirror ever made. This mirror, and six more like it, will form the heart of the 25-meter Giant Magellan Telescope (GMT), providing more than 380 square meters, or 4,000 square feet, of light-collecting area. The Giant Magellan Telescope will lead a next generation of giant telescopes that will explore planets around other stars and the formation of stars, galaxies and black holes in the early universe.

Tags: Science without borders, Astronomy

SENSORS

Developing the next generation of microsensors: Microscale optical accelerometer created

Science Daily, 22OCT2012

Setting the stage for a new class of motion sensors, researchers have developed a new ultrasensitive, microchip-scale accelerometer that uses laser light to measure displacement. Beyond consumer electronics, such sensors could help with oil and gas exploration deep within Earth, and could improve the stabilization systems of fighter jets. [TECHNICAL ARTICLE](#)

Tags: Sensors

STEM

Researchers launch innovative, hands-on online tool for science education

EurekaAlert, 22OCT2012

Computer scientists at the University of California, San Diego and at St. Petersburg Academic University in Russia, have developed a one-of-a-kind, hands-on online learning tool that, for the first time, weaves together science and programming education—and automatically grades homework too.

Tags: STEM

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