



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[Aerosols, Climate Change and The Dramatic Failure of Planck's Law](#)

[MIT Technology Review, 10SEP2012](#)

Researchers in Austria point out that when an object is large compared to the wavelength of the radiation it is emitting, then surface effects dominate. But when an object is small compared to the wavelength, then radiation can be emitted from any point within its volume. In that case the geometry of the particle must play a role. They show that fluctuational electrodynamics can accurately model the heat absorption and emission characteristics of nano-objects, the first time this has been possible. [TECHNICAL ARTICLE](#)

Tags: Environmental science, Climatology, Featured Article

[Scientists cast doubt on Heisenberg's uncertainty principle](#)

[Science Daily, 10SEP2012](#)

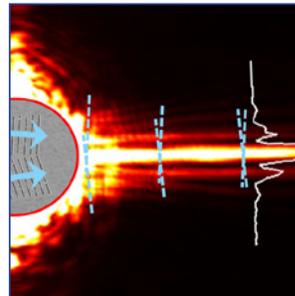
Researchers in Canada designed an apparatus to measure a property—the polarization—of a single photon. Before each photon was sent to the measurement apparatus, the researchers measured it weakly and then measured it again afterwards, comparing the results. They found that the disturbance induced by the measurement is less than Heisenberg's precision-disturbance relation would require. [TECHNICAL ARTICLE](#)

Tags: Breakthrough technology, S&T Canada, Science without borders, Featured Article

[Needle beam could eliminate signal loss in on-chip optics](#)

[Harvard University, 07SEP2012](#)

Harvard researchers create a light wave that propagates without spreading. The needle beam arises from a special class of quasiparticles called surface plasmons, which travel in tight confinement with a metal surface.



Researchers at SEAS demonstrated a cosine-Gauss plasmon beam, dubbed a "needle beam," that propagates without diffraction. (Courtesy of Patrice Genevet.)

The metallic stripes that carry these surface plasmons have the potential to replace standard copper electrical interconnects in microprocessors, enabling ultra-fast on-chip communications.

Tags: Photonics, Breakthrough technology, Communications Technology, Featured Article

S&T NEWS ARTICLES

ADVANCED MATERIALS

[High-temperature superconductivity induced in a semiconductor with Scotch tape](#)

[Science Daily, 11SEP2012](#)

An international team has developed a simple new technique using Scotch poster tape that has enabled them to induce high-temperature superconductivity in a semiconductor for the first time. The method paves the way for novel new devices that could be used in quantum computing and to improve energy efficiency. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

[Circuits so thin they float on water](#)

[Futurity.org, 05SEP2012](#)

A team of researchers at Cornell University has invented a way to pattern single atom films of graphene and boron nitride, an insulator, without the use of a silicon substrate. The technique, which they call patterned regrowth, could lead to substrate-free, atomically thin circuits—so thin, they could float on water or through air, but with tensile strength and top-notch electrical performance. [TECHNICAL ARTICLE](#)

Tags: Advanced materials

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AUTONOMOUS SYSTEMS & ROBOTICS

[DARPA's Cheetah Robot Bolts Past the Competition](#)[DARPA News, 10SEP2012](#)

The current version of the Cheetah robot is powered by an off-board hydraulic pump and uses a boom-like device to keep it running in the center of the treadmill. The increase in speed since results were last reported in March 2012 is due to improved control algorithms and a more powerful pump. [VIDEO](#)

Tags: Autonomous systems & robotics, DARPA, Government S&T

[Watch Darpa's Robotic Dog Follow Its Master Wired, 10SEP2012](#)

The AlphaDog—known as the LS3 or Legged Squad Support System—climbs rocks and trots after a soldier through wooded terrain. The machine, designed by Boston Dynamics, can stand upright, walk for 20 miles without a break and carry up to 400 pounds. Now the 'bot can obey instructions to follow people. The Marines want to eventually hook the robot up to their radios, which could make the 'bot become responsive to verbal commands. Not only that, it could give the LS3 the ability to talk back. [VIDEO](#)

Tags: Autonomous systems & robotics, Government S&T

[Video Friday: Fixbots, Barefoot Professors, and Keanu Reeves](#)[IEEE Spectrum, 07SEP2012](#)

This week's video theme is "a week without a video theme."

Tags: Autonomous systems & robotics

BIOTECHNOLOGY

[Tough gel stretches to 21 times its length, recoils, and heals itself](#)[Harvard University, 10SEP2012](#)

To create the tough new hydrogel, Harvard researchers combined two common polymers. The primary component is polyacrylamide, the second component is alginate, a seaweed. It is exceptionally tough, self-healing, and biocompatible. Beyond artificial cartilage, the researchers suggest that the new hydrogel could be used in soft robotics, optics, artificial muscle, as a tough protective covering for wounds, or "any other place where we need hydrogels of high stretchability and high toughness." [TECHNICAL ARTICLE](#)

Tags: Biotechnology, Advanced materials

BREAKTHROUGH TECHNOLOGY

[Researchers Create Short-Term Memories in Vitro](#)[Science Daily, 10SEP2012](#)

Using isolated pieces of rodent brain tissue, researchers at the Case Western Reserve University demonstrated

that they could form a memory of which one of four input pathways was activated. The neural circuits contained within small isolated sections of the hippocampus maintained the memory of stimulated input for more than 10 seconds. The information about which pathway was stimulated was evident by the changes in the ongoing activity of brain cells. [TECHNICAL ARTICLE](#)

Tags: Breakthrough technology, Neuroscience

COMMUNICATIONS TECHNOLOGY

[Longest fibre-optic sensor network exists developed for remote monitoring of large infrastructures](#)[Science Daily, 10SEP2012](#)

Researchers in Spain have developed the largest network so far in existence—measuring 250 km—that is equipped with a multiplexing capability, which enables two or more information channels to be combined within a single transmission medium. [TECHNICAL ARTICLE](#)

Tags: Communications Technology

[Researchers make first all-optical nanowire switch](#)[Nanowerk, 10SEP2012](#)

Researchers at the University of Pennsylvania have made an important advance in this frontier of photonics, fashioning the first all-optical photonic switch out of cadmium sulfide nanowires. Moreover, they combined these photonic switches into a logic gate. [TECHNICAL ARTICLE](#)

Tags: Communications Technology, Optical communication

ENERGY

[Wind could meet many times the world's total power demand by 2030, Stanford researchers say](#)[KurzweilAI, 12SEP2012](#)

The researchers adapted the three-dimensional, atmosphere-ocean-land computer model, known as GATOR-GCMOM, to calculate the theoretical maximum wind power potential on the planet, taking into account wind reduction by turbines. [TECHNICAL ARTICLE](#)

Tags: Energy, Wind energy

ENVIRONMENTAL SCIENCE

[Environmental Protection in the 21st Century National Academies, 10SEP2012](#)

A new report from the National Research Council finds that the foundation of science at the U.S. Environmental Protection Agency is strong, but the agency needs to continue to address numerous present and future challenges to maintain its science leadership and meet its

“The greatest danger in modern technology isn’t that machines will begin to think like people, but that people will begin to think like machines.” UNKNOWN

expanding mandates. The report highlights several environmental challenges that pertain to EPA’s mission as well as tools and technologies it could use to address them.

Tags: Environmental science

FORECASTING

Predicting a die throw

[Science Daily, 12SEP2012](#)

The researchers created a three-dimensional model of the die throw and compared the theoretical results to experimental observations. By using a high speed camera to track the die’s movement as it is thrown and bounces, they found the probability of the die landing on the face that is the lowest one at the beginning is larger than the probability of landing on any other face. This suggests that the toss of a symmetrical die is not a perfectly random action.

Tags: Forecasting

We are now one year away from global riots, complex systems theorists say

[KurzweilAI, 11SEP2012](#)

In a 2011 paper, researchers at the Complex Systems Institute (CSI) unveiled a model that accurately explained why the waves of unrest that swept the world in 2008 and 2011 crashed when they did. The number one determinant was soaring food prices. Their model identified a precise threshold for global food prices that, if breached, would lead to worldwide unrest. [Technology Review article](#) explains how CSI’s model works.

Tags: Forecasting

INFORMATION TECHNOLOGY

Computer, Read My Lips

[Science Newslne, 10SEP2012](#)

Researchers in Malaysia have developed a system using a genetic algorithm that gets better with each iteration to match irregular ellipse fitting equations to the shape of the human mouth displaying different emotions. They have used photos of individuals from South-East Asia and Japan to train a computer to recognize the six commonly accepted human emotions—happiness, sadness, fear, angry, disgust, surprise—and a neutral expression. The upper and lower lip is each analyzed as two separate ellipses by the algorithm.

Tags: Information Technology

Towards computing with water droplets—superhydrophobic droplet logic

[e! Science News, 10SEP2012](#)

Upon collision with each other on a highly water-repellent surface, two water droplets rebound like billiard balls.

Researchers in Finland demonstrated that water droplets could be turned into technology, “superhydrophobic droplet logic.” For example, a memory device was built where water droplets act as bits of digital information. Furthermore, devices for elementary Boolean logic operations were demonstrated. These simple devices are building blocks for computing. [VIDEO](#)

Tags: Information Technology, Materials science

MATERIALS SCIENCE

Manufacturing crack-resistant lightweight components

[Science Daily, 10SEP2012](#)

Researchers in Germany have developed a new process for making cold cracking more predictable. They are able to compute the probability of cold cracking as early as the design stage of a component, and immediately run through corrective measures. Whether such cold cracking occurs, and how quickly, depends on how high the concentration of hydrogen in the steel is, how the residual stress turns out, and how its microstructure is configured.

Tags: Materials science, Advanced manufacturing, S&T Germany

Northwestern researchers set world record for highest surface area material

[e! Science News, 10SEP2012](#)

Named NU-109 and NU-110, the materials belong to a class of MOFs that are promising vessels for natural gas storage for vehicles, catalysts, and other sustainable materials chemistry. The extremely high surface area was achieved using a carbon dioxide activation technique. As opposed to heating, which can remove the solvent but also damage the MOF material, the carbon dioxide-based technique removes the solvent gently and leaves the pores completely intact.

Tags: Materials science

Rust never sleeps: Observations of electron hopping in iron oxide hold consequences for environment and energy

[Science Daily, 10SEP2012](#)

Despite poor conductivity an electron transferred to a particle of rust will use thermal energy to continually move or “hop” from one atom of iron to the next. Electron mobility in iron oxide can hold huge significance for a broad range of environment- and energy-related reactions, including reactions pertaining to uranium in groundwater and reactions pertaining to low-cost solar energy devices. A team of researchers led by the Lawrence Berkeley National Laboratory has directly observed what happens

to electrons after they have been transferred to an iron oxide particle. [TECHNICAL ARTICLE](#)

Tags: Materials science, Government S&T

MICROELECTRONICS

[Faster signal storage and optical processing in nanomachined devices edge closer to realization](#)

[Nanowerk, 12SEP2012](#)

Researchers in Singapore observed bistability in a device consisting of two 60-micrometer-wide silicon rings into which they could feed laser light of wavelengths specific to the particular ring geometry they used. One segment of each ring hung above a gap, and these free-hanging arcs deformed slightly as light flowed through the ring. The deformation of the rings, in turn, changed their optical properties. As a result of this interplay between optical and mechanical forces, the researchers observed stable behavior at two wavelengths of the light, not one, as expected. By changing the wavelength of the incoming light, they could conveniently switch between these two states.

[TECHNICAL ARTICLE](#)

Tags: Microelectronics

FEATURED RESOURCE

[International Research Update](#)

Monthly Info flash on international cooperation activities in research and innovation published by the European Commission Research Directorate

[Intel's Haswell chips are engineered to cut power use](#)

[BBC News, 11SEP2012](#)

One version of the processors will run at 10 watts, about half as much as its current Ivy Bridge design. Intel said the improvement would mean devices could become thinner, faster and offer extended battery life. The chips were designed to better support "perceptual" tasks such as voice recognition, facial analysis and depth tracking.

Tags: Microelectronics

[Built-in Germanium Lasers could make Computer Chips faster](#)

[Alpha Galileo Foundation, 10SEP2012](#)

Researchers in Switzerland have demonstrated that as a laser material, Germanium together with Silicon could form the basis for innovative computer chips in which information would be transferred partially in the form of light. This technology would revolutionise data streaming within

chips and give a boost to the performance of electronics.

[TECHNICAL ARTICLE](#)

Tags: Microelectronics

[Semiconductors grown on graphene](#)

[e! Science News, 10SEP2012](#)

Researchers at the Norwegian University of Science and Technology (NTNU) have patented and are commercializing GaAs nanowires grown on graphene, a hybrid material with competitive properties. Semiconductors grown on graphene are expected to become the basis for new types of device systems, and could fundamentally change the semiconductor industry.

Tags: Microelectronics

[Researchers demonstrate low-noise, chip-based optical wavelength converter](#)

[Nanowerk, 06SEP2012](#)

Researchers from the NIST Center for Nanoscale Science and Technology have demonstrated a low-noise device for changing the wavelength of light using nanofabricated waveguides created on a silicon-based platform using standard planar fabrication technology. These new noise-free frequency converters are dramatically smaller than the nonlinear crystals and optical fibers and can be created in arrays and integrated with other on-chip devices using scalable silicon-based fabrication methods. [TECHNICAL ARTICLE](#)

Tags: Microelectronics, Government S&T

NEUROSCIENCE

[Brain filter for clear information transmission: Neuronal inhibition is key for memory formation](#)

[Science Daily, 10SEP2012](#)

Frequently, as many as one thousand signals rain down on a single neuron simultaneously. To ensure that precise signals are delivered, the brain possesses a sophisticated inhibitory system. Researchers in Germany have illuminated how this system works. [TECHNICAL ARTICLE](#)

Tags: Neuroscience, Breakthrough technology, S&T Germany

[Key Molecules Involved in Forming Long-Term Memories Discovered](#)

[Science Daily, 10SEP2012](#)

University of Pennsylvania scientists have come close to identifying key molecules that help convert short-term memories into long-term ones. These proteins may offer a target for drugs that can enhance memory, alleviating some of the cognitive symptoms that characterize conditions including schizophrenia, depression and Parkinson's and Alzheimer's diseases. [TECHNICAL ARTICLE](#)

Tags: Neuroscience

QUANTUM SCIENCE

Electronics without current: Finnish team to research the future of nanoelectronics

EurekAlert, 12SEP2012

The key idea behind the project is the quantum dot cellular automaton (QCA). In QCAs, pieces of semiconductor so small that single electronic charges can be measured and manipulated are arranged into domino like cells. Like dominos, these cells can be arranged so that the position of the charges in one cell affects the position of the charges in the next cell, which allows making logical circuits out of these “quantum dominos”. But, no charge flows from one cell to the next, i.e. no current. This, plus the extremely small size of QCAs, means that they could be used to make electronic circuits at densities and speeds not possible now. However, realisation of the dots and cells and making electrical connections to them has been a huge challenge.

Tags: Quantum science, Microelectronics

Quantum longitude—keeping track of qubits in the quantum sea

Nanowerk, 11SEP2012

Quantum computing depends exquisitely on the parts of a quantum system remaining coherent long enough—even in the face of environmental noise—for the computation to be performed. A scheme proposed by researchers at the University of Maryland should be helpful in sustaining coherence by carefully making mid-calculation corrections.

TECHNICAL ARTICLE

Tags: Quantum science

Quantum world only partially melts: Ultracold atoms reveal surprising new quantum effects

Science Daily, 10SEP2012

Scientists in Austria are investigating the transition of quantum systems as they approach thermal equilibrium. Between an ordered initial state and a statistically mixed final state, a so-called “quasi-stationary intermediate state” can emerge. This phenomenon is called “pre-thermalization.” Pre-thermalization is predicted to play a major role in many different non-equilibrium processes in quantum physics. It could, for example, help us to understand the state of the early universe. TECHNICAL ARTICLE

Tags: Quantum science

S&T POLICY

Engineering Research Centers awarded \$55.5M to innovate in nanotechnology and engineering

Nanowerk, 11SEP2012

NSF recently awarded \$55.5 million to university consortia to establish three new Engineering Research Centers (ERCs) that will advance interdisciplinary nanosystems research and education in partnership with industry. A long-term view for nanotechnology research

and education needs is documented in the 2010 NSF/WTEC report, *Nanotechnology Research Directions for Societal Needs in 2020*.

Tags: S&T policy, Advanced materials, Nanotechnology

Industrial Technologies—New publication from EUROPA

EUROPA research, 10SEP2012

Innovation policies in Germany, Finland, UK and the EU are mostly based on the same principles and tools. They also follow similar strategies: centres of excellence, support to SMEs, knowledge platforms, new forms of knowledge exchange, etc. The main differences between the three innovation systems appear in their focus and structure: Finland strongly focuses on social aspects, while Germany is mainly industry-driven. The UK is probably somewhere in between. Finland presents a very integrated model, in which the different actions and tools are linked to each other. REPORT

Tags: S&T policy, S&T EU

SCIENCE WITHOUT BORDERS

An Anyon Detector—Synopsis

American Physical Society Spotlight, 10SEP2012

A proposed interferometry experiment could detect quantum states, called anyons, which are neither bosons nor fermions. What distinguishes anyons from bosons and fermions is their quantum statistics: The wave function describing multiple bosons or fermions acquires a factor of 1 or -1 , respectively, if two particles are exchanged, but for anyons, the factor lies between 1 and -1 . TECHNICAL ARTICLE

Tags: Science without borders

Training Scientists to Communicate: Pick Your Model

Scientific American, 09SEP2012

Dr. Felt, a professor of sociology at the University of Vienna, suggested that we think critically about the increased scientific communication efforts that are taking place worldwide. In some instances they are called public engagement of science, public understanding of science, etc. But, she feels that why this is important remains largely unquestioned. Even policymakers provide moral, and at times, financial support for communication efforts.

Tags: Science without borders, STEM

SENSORS

Who (and what) can you trust? How non-verbal cues can predict a person's (and a robot's) trustworthiness

Science Daily, 11SEP2012

People face this predicament all the time—can you determine a person's character in a single interaction?

Can you judge whether someone you just met can be trusted when you have only a few minutes together? And if you can, how do you do it? Using a robot named Nexi, researchers in the US have figured out the answer.

Tags: Sensors

Indoor Navigation Takes Signals And Sensors **IEEE Spectrum, 10SEP2012**

Major mobile device makers and cell phone service providers have teamed up to develop a standard for indoor navigation. Google and Apple are not part of this standardization effort. To navigate in a crowded mall developers are starting to incorporate information from sensors within the phone, like pressure sensors that provide altitude, gyroscopes that determine if the user is turning and in which direction, and accelerometers that count steps. Sensor plus radio approach, in which you “basically trust the sensors in the system, and once in a while check in with a wireless signal” is the way to go, because it reduces power consumption compared with an approach that relies on constant radio signal access.

Tags: Sensors, Information technology

The pocket radar: Thumbtack-sized distance and motion sensor developed **Science Daily, 10SEP2012**

For the first time researchers in Germany have succeeded in integrating all relevant radio-frequency components into one chip housing. Users can solder the chip onto their standard circuit boards and receive low frequency signals that can be processed without difficulty. The sensor sends and receives electromagnetic waves having a frequency of 122 GHz, which corresponds to a wavelength of approximately two and a half millimeters. From the run time of the waves, the distance to an object that is several meters away is calculated with an accuracy of up to less than one millimeter.

Tags: Sensors, Microelectronics

Smart carpet detects falls and strange footsteps

New Scientist, 04SEP2012

Optical fibres in the carpet’s underlay create a 2D pressure map that distorts when stepped on. Sensors around the carpet’s edges then relay signals to a computer which is used to analyse the footstep patterns. By monitoring footsteps over time, the system can also learn people’s walking patterns and watch out for subtle changes, such as a gradual favouring of one leg over the other. It could then be used to predict the onset of mobility problems in the elderly, for example.

Tags: Sensors ■

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