



S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

[The potentially world-changing research that no one knows about](#)

[Foresight Institute, 29OCT2012](#)

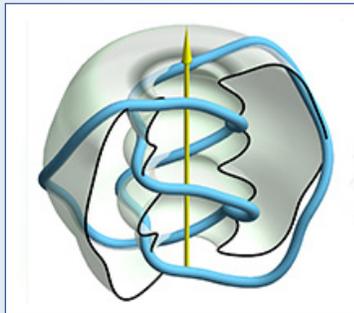
What happens when a different question is asked, specifically “What can be realized according to physical law?” This is the key premise of the [exploratory engineering](#) approach, a methodology proposed by [Eric Drexler](#) for assessing the capabilities of future technologies.

Tags: Forecasting, Featured Article

[Beautiful physics: tying knots in light](#)

[Australian National University, 26OCT2012](#)

An international team of scientists is designing knots in light, with potential applications in advanced modern optics, laser beams and even quantum computing. Using concepts from mathematics and physics



the model explored by the team creates optical vortices with dark cores in a bright laser beam, that can then tangle and form links and knots. [TECHNICAL ARTICLE](#)

Tags: Breakthrough technology, Photonics, S&T Australia, Featured Article

[Bacterial Wires Explain Enigmatic Electric Currents in the Seabed](#)

[Science Daily, 24OCT2012](#)

Researchers in Denmark made a sensational discovery that the electric currents they measured in the seabed was a process which takes place inside bacteria that are one centimetre long. They make up a kind of live electric cable that no one had ever imagined existed. [TECHNICAL ARTICLE](#)

Tags: Science without borders, Biology, Featured Article

S&T NEWS ARTICLES

AUTONOMOUS SYSTEMS & ROBOTICS

[Video Friday: Disaster HUBOs, Robot Massages, and Too Much Gangnam Style](#)

[IEEE Spectrum, 26OCT2012](#)

See the first video from an actual DARPA Disaster Response Challenge robot, and lots more.

Tags: Autonomous systems & robotics

BIOTECHNOLOGY

[Laser spotlight reveals machine ‘climbing’ DNA](#)

[Science Daily, 29OCT2012](#)

The experiments, reported by researchers in Oxford, use laser light to generate very bright patches close to single cells. When coupled with fluorescent tags this ‘spotlight’ makes it possible to image the inner workings of cells fast enough to see how the molecular machines inside change size, shape, and composition in the presence of DNA. The pioneering experiments will give fresh insights into the complex processes and pave the way for a new approach to biomedical research for understanding the causes of diseases and devise new strategies to combat them.

[TECHNICAL ARTICLE](#)

Tags: Biotechnology, S&T UK

[Test developed to detect early-stage diseases with naked eye: Prototype ultra sensitive disease sensor developed](#)

[Science Daily, 29OCT2012](#)

Researchers in England report that their visual sensor technology is ten times more sensitive than the current gold standard methods for measuring biomarkers. The sensor works by analysing serum, derived from blood, in a disposable container. If the result is positive for p24 or PSA, there is a reaction that generates irregular clumps of nanoparticles, which give off a distinctive blue hue in a solution inside the container. If the results are negative the nanoparticles separate into ball-like shapes, creating a reddish hue. Both reactions can be easily seen by the naked eye. [TECHNICAL ARTICLE](#)

Tags: Biotechnology, S&T UK

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COMMUNICATIONS TECHNOLOGY

Chip Makes Twisted Light for Communications[IEEE Spectrum, 24OCT2012](#)

Researchers in the United Kingdom and China have made a microchip capable of emitting laser beams with orbital angular momentum. Making twisted light requires shifting a laser's phase in a particular way. The multiplexer described at the March conference accomplished this with multiple waveguides carved onto a chip; the new device requires only one waveguide. This improvement allowed the researchers to shrink the emitter made from CMOS-compatible silicon photonic integrated circuits by several orders of magnitude.

Tags: Communications Technology

ENERGY

Black Silicon Solar Cells to Capture More Light[MIT Technology Review, 29OCT2012](#)

Black silicon is made by striking solar cells with lasers in the presence of sulfur gas to change the cells' texture. Researchers in Germany improved the efficiency of black silicon by controlling the laser pulse that drives the sulfur atoms into the silicon cell. Changing the position of the sulfur reduces the amount of infrared energy needed to excite electrons. It effectively creates an intermediate energy level where more infrared light is able to produce electricity. [RELATED ARTICLE](#)

Tags: Energy, Materials science, Solar energy

Next-generation antireflection coatings could improve solar photovoltaic cell efficiency[Science Daily, 29OCT2012](#)

Researchers at Rensselaer Polytechnic Institute used materials with tunable refractive index to design and fabricate a four-layer antireflection coating which cuts down the amount of light reflected away from a cell's surface. The additive fabricating process lends itself to the incorporation of antireflection coating design into solar cell device structures for application-specific requirements.

Tags: Energy, Solar energy

EXPLOSIVES

Boeing missile zaps electronic devices in first test flight[KurzweilAI, 30OCT2012](#)

Boeing successfully tested the Counter-electronics High-powered Microwave Advanced Missile Project (CHAMP) during a flight over the Utah Test and Training Range. CHAMP, which renders electronic targets useless, is a non-kinetic alternative to traditional explosive weapons that use the energy of motion to defeat a target.

Tags: Explosives, Military technology

FORECASTING

How to identify and predict human activities from video[KurzweilAI, 30OCT2012](#)

Carnegie Mellon University's Mind's Eye program is creating intelligent software that will recognize human activities in video and predict what might happen next. It will also flag unusual events and deduce actions that may be occurring off-camera.

Tags: Forecasting, Sensors

GOVERNMENT S&T

Titan supercomputer debuts: Computer churns through more than 20,000 trillion calculations each second[Science Daily, 29OCT2012](#)

Oak Ridge National Laboratory has just launched a new era of scientific supercomputing with Titan, a system capable of churning through more than 20,000 trillion calculations each second—or 20 petaflops—by employing a family of graphic processing units first created for computer gaming. Titan will be 10 times more powerful than ORNL's last world-leading system, Jaguar, while overcoming power and space limitations inherent in the previous generation of high-performance computers.

Tags: Government S&T, Information technology

INFORMATION TECHNOLOGY

Data storage: Going with the grain[Nanowerk, 29OCT2012](#)

One method under current investigation is storing each data bit in a single magnetic grain of the thin film of the recording medium, rather than in several grains as in conventional hard drives. Storage in single grains only would increase stability and reduce the magnetic fields required to write bits. By modeling write processes in hard disks, researchers in Singapore have demonstrated how this is possible in practice. [TECHNICAL ARTICLE](#)

Tags: Information Technology

Recyclable electronics: Just add hot water[PhysOrg.com, 29OCT2012](#)

The National Physical Laboratory (NPL) and their partners have developed a printed circuit board (PCB) whose components can be easily separated by immersion in hot water. The work was part of the ReUSE project, funded by the UK government's Technology Strategy Board.

Tags: Information Technology

“Science has not yet mastered prophecy. We predict too much for the next year and yet far too little for the next ten.” NEIL ARMSTRONG

Ministry of Science and Technology issued plan for China's cloud computing industry

China NOST News, 26OCT2012

The Plan aims at the establishment of China's cloud computing technology system and standards and breakthroughs in key technologies by 2015 in cloud computing equipment, core software and supporting platforms. The Plan encourages diversified channels of investments and public-private partnership in R&D and innovation. International cooperation in this field will be enhanced.

Tags: Information Technology, S&T China, S&T Policy

MATERIALS SCIENCE

Microbullets reveal material strengths (w/video)

Nanowerk, 30OCT2012

Researchers analyze the effects of projectile impacts at the nanoscale. In the process, they gathered a surprising amount of information about how materials called block copolymers dissipate the strain of sudden impact. The goal of the researchers is to find novel ways to make materials more impervious to deformation or failure for stronger and lighter body armor, jet engine turbine blades for aircraft, and for cladding to protect spacecraft and satellites from micrometeorites and space junk. [VIDEO](#)

Tags: Materials science

Graphene appears to be the most effective material for EMI shielding

Nanowerk Spotlight, 29OCT2012

Scientists in Korea have demonstrated that single-layer graphene is an excellent choice of material for high-performance EMI shielding. They found that CVD-synthesized graphene shows more than seven times greater EMI shielding effectiveness (in terms of dB) than gold film of the same thickness. [TECHNICAL ARTICLE](#)

Tags: Materials science

High-tech band-aids

Nanowerk Spotlight, 29OCT2012

Researchers in France have reported the fabrication of asymmetric free-standing layer-by-layer film with asymmetric wettability—one surface is superhydrophobic and the other one is hydrophilic. The superhydrophobic surface proved to be self-cleaning, anti-wetting and limit bacterial adhesion, while the hydrophilic surface could extensively deliver bactericidal silver ions. [TECHNICAL ARTICLE](#)

Tags: Materials science, S&T France

Scientists develop revolutionary nanotechnology copper solder

Nanowerk, 29OCT2012

Scientists in the US have developed a revolutionary nanotechnology copper-based electrical interconnect material, or solder, that can be processed around 200 C. Once fully optimized, the QuantumFuse™ solder material is expected to produce joints with up to 10 times the electrical and thermal conductivity compared to tin-based materials currently in use.

Tags: Materials science

Scientists use molecular layers to study nanoscale heat transfer

Science Daily, 29OCT2012

Researchers at the University of Illinois at Urbana-Champaign have developed a novel system for examining and measuring nanoscale thermal conductance at the interface between two materials. With further refinement, the scientists believe their advance may one day provide data for applications such as harvesting electricity from waste heat, better cooling of microelectronic devices and “heat-seeking” targeting of disease cells by hyperthermal therapeutics.

Tags: Materials science

MICROELECTRONICS

IBM reports nanoelectronics breakthrough

Nanowerk, 29OCT2012

The approach developed at IBM labs paves the way for circuit fabrication with large numbers of carbon nanotube transistors at predetermined substrate positions. The ability to isolate semiconducting nanotubes and place a high density of carbon devices on a wafer is crucial to assess their suitability for a technology—eventually more than one billion transistors will be needed for future integration into commercial chips.

Tags: Microelectronics

NEUROSCIENCE

Unique protein bond enables learning and memory

Science Daily, 30OCT2012

Two proteins have a unique bond that enables brain receptors essential to learning and memory to not only get and stay where they're needed, but to be hauled off when they aren't, researchers say. NMDA receptors increase the activity and communication of brain cells and are strategically placed, much like a welcome center, at the receiving

end of the communication highway connecting two cells. They also are targets in brain-degenerating conditions such as Alzheimer's and Parkinson's. [TECHNICAL ARTICLE](#)

Tags: Neuroscience

[Brainwave training boosts network for cognitive control and affects mind-wandering](#) [Science Daily, 29OCT2012](#)

A breakthrough study has found that training of the well-known brainwave in humans, the alpha rhythm, enhances a brain network responsible for cognitive-control. The training technique, termed neurofeedback, is being considered as a promising new method for restoring brain function in mental disorders such as attention deficit hyperactivity disorder, schizophrenia, depression and post-traumatic stress disorder. [TECHNICAL ARTICLE](#)

Tags: Neuroscience, S&T Canada

FEATURED RESOURCE

[Science Watch](#)

Open Web resource for science metrics and analysis; combines the newest Science Watch© newsletter material, along with regularly updated data, analysis, interviews, and commentary; Source data drawn from Essential Science IndicatorsSM from Thomson Reuters.

QUANTUM SCIENCE

[Entangled Particles Break Classical Law of Thermodynamics, Say Physicists](#)

[MIT Technology Review, 29OCT2012](#)

Japanese physicists show how to extract more energy from entangled particles than is possible with classical thermodynamics. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[Looking beyond space and time to cope with quantum theory](#)

[Science Daily, 29OCT2012](#)

The proposed experiment is based on what the researchers call a 'hidden influence inequality'. This exposes how quantum predictions challenge our best understanding about the nature of space and time, Einstein's theory of relativity. [TECHNICAL ARTICLE](#)

Tags: Quantum science

[Quantum communication without entanglement could perform faster than previously thought possible](#)

[PhysOrg.com, 29OCT2012](#)

Scientists from Japan and the UK have presented an alternative design for a quantum communication network that requires neither entanglement between nodes nor quantum memories. Instead, the scheme transmits quantum information in encoded form directly across the network, using devices that act as quantum repeaters (without entanglement) to transmit and receive information between each other. [TECHNICAL ARTICLE](#)

Tags: Quantum science

S&T POLICY

[China publishes its 2011 R&D Statistics](#)

[China NOST News, 29OCT2012](#)

According to latest science and technology statistics published yesterday, China spent RMB 868.7 billion yuan, or 1.87% of its total GDP, on R&D activities in 2011, a 23% increase from the previous year. Basic research used 4.7% of the R&D expenditure, 11.8% for applied research and the remaining 83.5% was for development. Of this year's total R&D spending, 75.7% was provided by companies and 22.9% came from government investment.

Tags: S&T policy, S&T China

SCIENCE WITHOUT BORDERS

[Big problems, Big solutions](#)

[MIT Technology Review, 29OCT2012](#)

Over a billion people still have no electricity, millions lack clean water, education is inaccessible to many, the climate is changing rapidly, traffic snarls cities, and dementia and cancer can strike any of us. In this Special issue we introduce the technologists who haven't given up trying to solve problems like these.

Tags: Science without borders

[Earth's magnetosphere behaves like a sieve](#)

[Science Daily, 29OCT2012](#)

Analysis of ESA's quartet of satellites, Cluster, has now found that KH (Kelvin-Helmholtz) waves can also occur at a wider range of magnetopause locations and when the IMF (interplanetary magnetic field) is arranged in a number of other configurations, providing a mechanism for the continuous transport of the solar wind into Earth's magnetosphere. [TECHNICAL ARTICLE](#)

Tags: Science without borders, Space technology

R&D 100 Awards Categories**R&D Magazine, 24OCT2012**

To help readers navigate the list of R&D 100 winners, the technologies are organized into categories. View these general categories and recent winners.

Tags: Science without borders

SENSORS**Mind-reading headband sends brainwaves via Bluetooth****Wired UK, 29OCT2012**

A brainwave-sensing headband aims to create more productive ways of thinking by offering wearers the ability to see their brain function in real time. Sensors at the front and sides of the headband gather information on how your brain is functioning via electroencephalography (EEG scanning), which it can then send to your smartphone or tablet via Bluetooth.

Tags: Sensors

Near-atomically flat silicon could help pave the way to new chemical sensors**Science Newline, 29OCT2012**

Silicon is the workhorse of the electronics industry, serving as the base material for the tiny transistors that make it possible for digital clocks to tick and computers to calculate. Now scientists have succeeded in creating near-atomically flat silicon, of the orientation used by the electronics industry, in a room temperature reaction. The flat silicon might one day serve as the base for new biological and chemical sensors. [TECHNICAL ARTICLE](#)

Tags: Sensors

World's first super-wide-angle 3D laser radar with a horizontal and vertical range of 140 degrees**PhysOrg.com, 29OCT2012**

Fujitsu Laboratories has developed a 3D laser radar that is able to measure distances to objects over a wide detection angle range. It does this by using a newly developed scanning angle expansion lens to beam the laser over a wide-angle range, and a high speed, multipoint laser scanning system to detect a wide range at high speed.

Tags: Sensors

STEM**DOD Faces Potential Shortfall in Quality STEM Workers; Overhaul of Recruitment Practices, Security Requirements Needed****National Academies, 29OCT2012**

DOD recruitment policies and practices should be reviewed and overhauled as necessary to ensure that the department is fully competitive with all sectors of American industry and the global STEM marketplace. The agency will also need to reassess its requirement for security clearances for some STEM positions. [REPORT](#)

Tags: STEM ■

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