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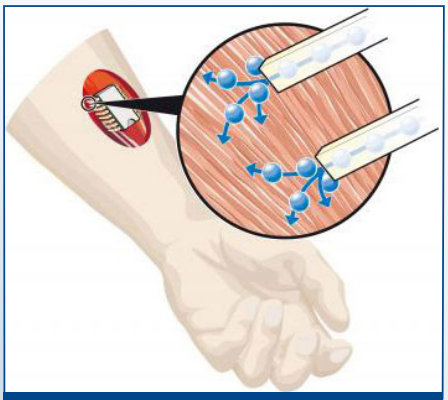
S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles



The chemical chip can control the delivery of the neurotransmitter acetylcholine. This enables chemical control of muscles, which are activated when they come into contact with acetylcholine. (Credit: LiU/Ingemar Franzén)

The first chemical circuit developed

Nanowerk, 29MAY2012

Researchers in Sweden previously developed ion transistors for transport of both positive and negative ions, as well as biomolecules. They have now taken the next step by developing chemical chips that also contain logic gates, such as NAND gates that allow for the construction of all logical functions. This breakthrough creates the basis for an entirely new circuit technology based on ions and molecules instead of electrons and holes. TECHNICAL ARTICLE

Tags: Microelectronics, Breakthrough technology, Featured Article

US Military Chips "Compromised"

MIT Technology Review, 29MAY2012

As military hardware uses more off the shelf components, it has become vulnerable to common exploits. A researcher in Cambridge has issued a report claiming that a common sort of reprogrammable microchip (an FPGA) contains a deliberately-obscured backdoor that would allow anyone with knowledge of it to clone or reprogram the chip. These chips are really common, and show up in everything from drones to nuclear power plants. TECHNICAL ARTICLE

Tags: Cyber security, Featured Article

Thousands of Invisibility Cloaks Trap a Rainbow

Science Daily, 25MAY2012

"In our array, light is stopped at the boundary of each of the cloaks, meaning we observe the trapped rainbow at the edge of each cloak. This means we could do 'spectroscopy on-a-chip' and examine fluorescence at thousands of points all in one go." The 25,000 invisibility cloaks are uniformly laid out on a gold sheet, with each having a microlens that bends light around itself, effectively hiding an area in its middle. As the light squeezes through the gaps between each of the cloaks, the different components of light, or colours, are made to stop at ever narrower points, creating the rainbow. TECHNICAL ARTICLE

Tags: Advanced materials, Featured Article

S&T News Articles

ADVANCED MANUFACTURING

Obama Administration Launches $26 Million Multi-agency Competition to Strengthen Advanced Manufacturing Clusters Across the Nation

NSF News, 29MAY2012

These coordinated investments will help catalyze and leverage private capital, build an entrepreneurial ecosystem, and promote cluster-based development in regions across the United States.

Tags: Advanced manufacturing, S&T Policy

Microreactors to produce explosive materials

Fraunhofer Research Institute, 28MAY2012

Researchers at the Fraunhofer Institute in Germany have developed a method for safer production of nitroglycerine: a microreactor process, tailored to this specific reaction. What makes the process safer are the tiny quantities in-

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volved. If the quantities are smaller, less heat is generated. And because the surface is very expansive compared to the volume involved, the system is very easy to cool.
Tags: Advanced manufacturing

ADVANCED MATERIALS

How to make a material that shrinks when stretched

Physics World, 28MAY2012
New metamaterials that shrink under tension and expand under compression might soon become a reality thanks to theoretical work done by scientists in the US. The trick is to design a material with two metastable structural configurations, one more compact than the other. The desired response would occur if the material could jump into the more compact state if the tension is increased beyond a particular value.
Tags: Advanced materials, Metamaterials

Stunning image of Olympicene - the smallest possible five-ringed structure (w/video)

Nanowerk, 28MAY2012
Scientists have created and imaged the smallest possible five-ringed structure—about 100,000 times thinner than a human hair—and you'll probably recognize its shape. VIDEO
Tags: Advanced materials, Nanotechnology

'Unzipped' carbon nanotubes could help energize fuel cells and batteries, Stanford scientists say

EurekAlert, 28MAY2012
The Stanford University team used multi-walled carbon nanotubes consisting of two or three concentric tubes nested together. The scientists showed that shredding the outer wall, while leaving the inner walls intact, enhances catalytic activity in nanotubes, yet does not interfere with their ability to conduct electricity.
Tags: Advanced materials, Energy

Cloak-on-a-chip unveiled

Physics World, 25MAY2012
Researchers placed a gold-coated lens on top of a gold-coated glass slide, where the area between the two surfaces acted as the waveguide. The team found that light travelled around the space where the two surfaces touched. Now, the same team has made thousands of these cloaks—with each cloak being about 30 μm in diameter—that are then laid out together on a gold sheet. Each microlens bends light around itself, effectively hiding the area it contains.
Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Engineers Develop Cheap Onboard Tracking System For UAVs

MIT Technology Review, 29MAY2012
With Department of Defense funding, researchers at the University of North Dakota have built their own image processing machine, which is small and light enough to be carried by a small UAV. They say their device is capable of tracking objects such as cars and houses in real time without the need for number crunching on the ground. TECHNICAL ARTICLE
Tags: Autonomous systems & robotics

Is Drone Proliferation about to Explode?

Drone Wars UK, 26MAY2012
We have posted the results of our research here in our new database of large drones in military service. According to our research 31 countries currently have Class 3 or Class 2 military drones in their inventories. Many others are working to develop or acquire large drones or will have the smaller Class 1 drone in their inventory. See here for a general guide to drone sizes.
Tags: Autonomous systems & robotics

Robots will quickly recognize and respond to human gestures, with new algorithms

Science Daily, 25MAY2012
Researchers in Singapore have created a computer program which recognizes human gestures quickly and accurately, and requires very little training. TECHNICAL ARTICLE
Tags: Autonomous systems & robotics

Video Friday: Curiosity Learns to Scoop, Robot Tentacle Learns to Grab, iCub Learns About Rolling

IEEE Spectrum, 25MAY2012
It's a learning-filled Video Friday filled with learning, and videos, and robots.
Tags: Autonomous systems & robotics, Robotics

BIOTECHNOLOGY

Powerful new approach to attack flu virus

e! Science News, 28MAY2012
An international research team improved its proteins through a process called "DNA deep sequencing." This allowed the team to simultaneous sequence millions of variants of their manufactured proteins, identify and keep the beneficial mutations and optimize the proteins' performance. This research also laid the groundwork for future treatments of all flu viruses as well as other diseases such as smallpox.
Tags: Biotechnology, Biology, Medical technology

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"By the time most scientists have reached age thirty they are trapped by their own expertise." FRANCIS CRICK

Device may inject a variety of drugs without using needles

MIT News, 24MAY2012

MIT researchers have engineered a jet-injection system that delivers a range of doses to variable depths in a highly controlled manner. The design is built around a mechanism called a Lorentz-force actuator—a small, powerful magnet surrounded by a coil of wire that's attached to a piston inside a drug ampoule. When current is applied, it interacts with the magnetic field to produce a force that pushes the piston forward, ejecting the drug at very high pressure and velocity (almost the speed of sound in air) out through the ampoule's nozzle—an opening as wide as a mosquito's proboscis.

Tags: Biotechnology

'Killer Silk:' Making Silk Fibers That Kill Anthrax And Other Microbes in Minutes

Science Newsline, 24MAY2012

Researchers in the US have developed a chlorinated form of silk, which involves soaking silk in a solution that includes a substance similar to household bleach and letting it dry. Silk treated for just an hour killed essentially all of the E. coli bacteria tested on it within 10 minutes and did similarly well against spores of a close anthrax relative used as a stand-in.

Tags: Biotechnology

BREAKTHROUGH TECHNOLOGY

Beam Me Up: 'Tractor beams' of light pull small objects towards them

Science Daily, 25MAY2012

Based on pioneering work by Albert Einstein and Max Planck more than a hundred years ago, it is known that light carries momentum that pushes objects away. What researchers in Singapore have now shown theoretically for Bessel beams is that for particles that are sufficiently small, the light scatters off the particle in a forward direction, meaning that the particle itself is pulled backwards towards the observer. In other words, the behaviour of the particle is the direct opposite of the usual scenario. The size of the tractor beam force depends on parameters such as the electrical and magnetic properties of the particles. TECHNICAL ARTICLE

Tags: Breakthrough technology

ENERGY

The world's largest solar thermal power plant

KurzweilAI, 28MAY2012

The $2.2 billion project stretches over 3,600 acres near Ivanpah, California. When it's finished, it will generate 370 megawatts of electricity on sunny days. The solar thermal plant uses concentric circles of mirrors that will focus sunlight onto a central tower, generating high temperatures to produce steam. The plant will feature three towers, each with its own set of mirrors. The first unit is the nearest to completion. By February of this year, workers had begun to install mirrors.

Tags: Energy, Solar energy

GOVERNMENT S&T

Smart Bullets

IEEE Spectrum, 25MAY2012

A team of engineers at Sandia National Laboratories is completing a testable prototype of the world's first laser-guided bullet. An infrared laser illuminates a target, which the bullet's optical sensors follow. An onboard tracking chip calculates the course corrections, carried out by four actuator-controlled fins on the bullet's body. The end result is a bullet that could improve its shooter's marksmanship by 98 percent, at distances between 1 and 2 kilometers.

Tags: Government S&T, DOE, Military technology

INFORMATION TECHNOLOGY

Where Speech Recognition Is Going

MIT Technology Review, 29MAY2012

Voice-controlled interfaces are showing up in mobile phones, TVs, and automobiles. One company believes it can give just about everything a voice. The combination of more data and more computing power means you can do things today that you just couldn't do before. You can use more sophisticated statistical models.

Tags: Information Technology

How to Stuff Five Universities Into One Computer Center

IEEE Spectrum, 28MAY2012

Top research universities are increasingly obligated to make that number-crunching power as simple and seamlessly accessible as possible. So MGHPCC (Massachusetts Green High-Performance Computing Center) provides "ping, power, and pipe" for its members' terascale computing needs. Each of MGHPCC's five member institutions—Boston University, Harvard University, MIT, Northeastern University, and the University of Massachusetts system—will by year's end begin transitioning research computing over to the center. By 2020, high-performance computing will be well into the exascale.

Tags: Information Technology

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Scientists invent revolutionary chipset for high-speed wireless data transfer

PhysOrg.com, 24MAY2012

The chipset employs wireless millimetre-wave technology to transmit large packets of information while consuming little power. This enables low-power applications, like smart phones and tablets, to transmit/receive data between platforms, like projectors and TVs, without the need for cables for the very first time.

Tags: Information Technology

Featured Resource

JoVE

Journal of Visualized Experiments is a peer reviewed, PubMed indexed journal devoted to the publication of biological, medical, chemical and physical research in a video format. RSS

MATERIALS SCIENCE

Copper-nickel nanowires could be perfect fit for printable electronics

Science Daily, 29MAY2012

Duke University chemists created a new set of flexible, electrically conductive nanowires from thin strands of copper atoms mixed with nickel. The copper-nickel nanowires, in the form of a film, conduct electricity even under conditions that break down the transfer of electrons in plain silver and copper nanowires. Films made with copper-nickel nanowires are stable and inexpensive, good candidates for printed electronics, electronic paper, smart packaging and interactive clothing. TECHNICAL ARTICLE

Tags: Materials science

Computer model pinpoints prime materials for efficient carbon capture

Nanowerk, 27MAY2012

A new computer model developed by the University of California, Berkeley, shows that less expensive technologies are on the horizon. "Our database of carbon capture materials is going to be coupled to a model of a full plant design, so if we have a new material, we can immediately see whether this material makes sense for an actual design," researchers said.

Tags: Materials science, Energy

Slip-and-slide power generators

EurekAlert, 26MAY2012

The harvester produces power when an electrically conductive droplet (mercury or an ionic liquid) slides along a thin microfabricated material called an electret film, which has a permanent electric charge built into it during deposition. Cyclic tilting of the device causes the droplet to accelerate across the film's surface; the maximum output voltage (and power) occurs when the sliding droplet reaches its maximum velocity at one end of the film. A prototype harvester demonstrated a peak output power at 0.18 microwatts, using a single droplet 1.2 millimeters in diameter sliding along a 2-micrometer-thick electret film.et to generate electrical power.

Tags: Materials science, Energy

MICROELECTRONICS

Path to 14-nm with directed self-assembly

Next Big Future, 28MAY2012

Applying a relatively simple combination of chemical and thermal processes to create their DSA method for making circuits at 22 nm, the research team at Stanford University projects that the nanofabrication technique will enable pattern etching for next-generation chips down to 14nm.

Tags: Microelectronics

QUANTUM SCIENCE

Mathematicians can conjure matter waves inside an invisible hat

Science Daily, 29MAY2012

Mathematicians have devised an amplifier that can boost light, sound or other waves while hiding them inside an invisible container. The researchers envision building a quantum microscope that could capture quantum waves, the waves of the nanoworld. A quantum microscope could, for example, be used to monitor electronic processes on computer chips.

Tags: Quantum science

SCIENCE WITHOUT BORDERS

Anarchists attack science

Nature News, 28MAY2012

A group calling itself the Olga Cell of the Informal Anarchist Federation International Revolutionary Front has claimed responsibility for the non-fatal shooting of a nuclear-engineering executive on 7 May in Genoa, Italy. The same group sent a letter bomb to a Swiss pro-nuclear lobby group in 2011 and attempted to bomb IBM's nanotechnology laboratory in Switzerland in 2010.

Tags: Science without borders

SENSORS

Super-sensitive tests could detect diseases earlier

EurekAlert, 28MAY2012

The biosensors developed by researchers in the UK consist of nanoscopic-sized gold stars floating in a solution containing other blood derived proteins. Attached to the surface of these gold stars are antibodies, which latch onto

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PSA when they detect it in a sample. A secondary antibody, which has an enzyme called glucose oxidase attached to it, recognises the PSA and creates a distinctive silver crystal coating on the gold stars, which is more apparent when the PSA biomarkers are in low concentrations.

Tags: Sensors, Biotechnology

Ageing eyes hinder biometric scans

Nature News, 25MAY2012

Identifying people by scanning the irises of their eyes may not be as reliable as some governments and the public might think. That's according to new research suggesting that irises, rather than being stable over a lifetime, are susceptible to ageing effects that steadily change their appearance over time.

Tags: Sensors, Biometrics

STEM

Science magazine prize awarded to course that brings biology and math worlds closer

EurekAlert, 26MAY2012

An undergraduate course that allows students to build mathematical models of biological phenomena—and to experience a convergence of disciplines with potential in areas ranging from cancer treatment to reforestation—is the winner of the Science Prize for Inquiry-Based Instruction.

Tags: STEM

Two SEAS profs envision the next big ideas in teaching and learning

Harvard University, 24MAY2012

Imagine a world where students learn not from pricey textbooks, but from a priceless community. They will transform teaching by making course texts digital and networked, among professors as well as students. Professors will be able to browse syllabi from around the world, and then drag and drop the most fitting elements for their own classes. They'll contribute their own changes back to the commons, making for rapid microevolution of the texts and criticisms that spark student reaction and discussion.

Tags: STEM ■

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Dr. Melissa Flagg
Director, Office of Technical Intelligence (OTI)

Ms. Hema Viswanath
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