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S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

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FEATURE ARTICLES

MIT project could transform robotic design and production

EurekAlert, 03APR2012

The Massachusetts Institute of Technology is leading an ambitious new project to reinvent how robots are designed and produced. Funded by a $10 million grant from the National Science Foundation, the project will aim to develop a desktop technology that would make it possible for the average person to design, customize and print a specialized robot in a matter of hours.

Tags: Autonomous systems & robotics, Featured Article

Self-sculpting sand

MIT News, 02APR2012

New algorithms could enable heaps of 'smart sand' that can assume any shape, allowing spontaneous formation of new tools or duplication of broken mechanical parts. A heap of smart sand would be analogous to the rough block of stone that a sculptor begins with. The individual grains would pass messages back and forth and selectively attach to each other to form a three-dimensional object; the grains not necessary to build that object would simply fall away. When the object had served its purpose, it would be returned to the heap. Its constituent grains would detach from each other, becoming free to participate in the formation of a new shape. VIDEO

To test their algorithm, the researchers designed and built a system of 'smart pebbles'—cubes about 10 millimeters to an edge, with processors and magnets built in. Photo: M. Scott Brauer

Tags: Autonomous systems & robotics, Featured Article

PTSD genes identified by UCLA study

e! Science News, 02APR2012

UCLA scientists findings suggest that susceptibility to PTSD is inherited, pointing to new ways of screening for and treating the disorder. The researchers found that persons who possessed specific variants of two genes were more likely to develop PTSD symptoms. Called TPH1 and TPH2, these genes control the production of serotonin, a brain chemical that regulates mood, sleep and alertness—all of which are disrupted in PTSD.

Tags: Medical Sciences, Military medicine, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

Revolutionary "Smart Wing" Created for UAV Model Demonstrates 3D Printing is Merged with Printed Electronics

Next Big Future, 25MAR2012

Stratasys and Optomec Inc. have successfully completed a joint development project to merge 3D printing and printed electronics to create the world's first fully printed hybrid structure. The ability to fabricate functional electronics into complex-shaped structures using additive manufacturing can allow UAVs to be built more quickly, with more customization, potentially closer to the field where they're needed. All these benefits can lead to efficient, cost-effective fielded vehicles.

Tags: Advanced manufacturing, Autonomous systems & robotics

ADVANCED MATERIALS

Scientists find breakthrough process for metal electrodes

R&D Magazine, 03APR2012

Cornell University chemists have now developed a way to make porous metal films with up to 1,000 times the electrical conductivity offered by previous methods. They are

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using an amino acid to link metal atoms to silica molecules since one end of the amino acid molecule has an affinity for silica and the other end for metals.

Tags: Advanced materials

Honeycombs of nanomagnets could lead to new type of computer processing

Nanowerk, 30MAR2012

Researchers from Imperial College London have demonstrated that a honeycomb pattern of nano-sized magnets, in a material known as spin ice, introduces competition between neighbouring magnets, and reduces the problems caused by these interactions by two-thirds. They have shown that large arrays of these nano-magnets can be used to store computable information. The arrays can then be read by measuring their electrical resistance.

Tags: Advanced materials, Nanomaterials

Natcore Scientists Create "Absolute Black"

Nanowerk, 29MAR2012

Scientists at Natcore Technology Inc., using simple liquid bath processes, have created a black surface on a silicon wafer with an average reflectance in the visible and near-infrared region of the solar spectrum of 0.3%, making it the "blackest" silicon solar cell surface ever recorded. This represents a tenfold reduction in reflectance over that portion of the spectrum, which is the source of about 80% of the usable power that can be drawn from sunlight. It would mean that up to 3% more usable light would get into the cell, effectively increasing the cell efficiency by that amount.

Tags: Advanced materials, Energy, Materials science, Solar energy

Physicists find patterns in new state of matter (w/video)

Nanowerk, 29MAR2012

Scientists at UCSD describe the emergence of "spontaneous coherence," "spin textures" and "phase singularities" when excitons—the bound pairs of electrons and holes that determine the optical properties of semiconductors and enable them to function as novel optoelectronic devices—are cooled to near absolute zero. This cooling leads to the spontaneous production of a new coherent state of matter.

Tags: Advanced materials, Materials science, Quantum science

Physicists Propose Yet Another Form of Superhard Carbon

MIT Technology Review, 29MAR2012

Recently there was debate amongst materials scientists over the nature of a new form of carbon that was recently discovered by compressing graphite at room temperature to pressures in excess of 10 GigaPascals. Now researchers in China propose two new superhard structures, which they call S-carbon and H-carbon. They claim that the new structures are more stable than M or W-carbon and even more stable than graphite at high pressures.

Tags: Advanced materials, Nanomaterials

AUTONOMOUS SYSTEMS & ROBOTICS

Boston Dynamics' sand flea robot jumps 10 meters

KurzweilAI, 30MAR2012

Sand Flea has no trouble clearing a 10-meter obstacle (about 30 feet), and it's accurate enough that you can ask it to jump through a window two stories up and it'll do it. The piston (which fires out the back of the robot) is powered by a carbon-dioxide cannister, and Sand Flea can make 25 jumps in a row before it needs to juice itself up again. It is intended to be used in Afghanistan to hop over walls, take a look around, and hop right back home again. VIDEO

Tags: Autonomous systems & robotics

'Living' micro-robot could detect diseases in humans

Science Daily, 29MAR2012

A tiny prototype robot that functions like a living creature is being developed which one day could be safely used to pinpoint diseases within the human body. Called 'Cyberplasm', it will combine advanced microelectronics with latest research in biomimicry. The aim is for Cyberplasm to have an electronic nervous system, 'eye' and 'nose' sensors derived from mammalian cells, as well as artificial muscles that use glucose as an energy source to propel it.

Tags: Autonomous systems & robotics, Biomimetics, Microrobots

BIG DATA

Made in IBM Labs: New IBM Software Accelerates Decision Making in the Era of Big Data

IBM, 03APR2012

To help clients meet these challenges, IBM is unveiling DB2 10 and InfoSphere Warehouse 10 software that easily integrates with big data systems, automatically compresses data into tighter spaces to prevent storage sprawl, and slices information from the past, present, and future to eliminate expensive application code.

Tags: Big data, Information technology

DARPA Calls for Advances in "Big Data" to Help the Warfighter

DARPA, 29MAR2012

Recognizing the challenges presented by the volume of data, DARPA began the XDATA program to develop computational techniques and software tools for processing and analyzing the vast amount of mission-oriented information for Defense activities. To enable large scale data processing in a wide range of potential settings, XDATA plans to release open-source software toolkits to enable collaboration among the applied mathematics, computer science and data visualization communities. Solicitation

Tags: Big data, DARPA, Government S&T

continued...

"All inquires carry with them some element of risk. There is no guarantee that the universe will conform to our predispositions" CARL SAGAN

World's Largest Dataset on Human Genetic Variation Goes Public

IEEE Spectrum, 29MAR2012

The entire contents of the National Institutes of Health's 1000 Genomes Project—all 200-terabytes of it—will be made freely available to the public. The project aims to provide a foundation for investigating how human genetic variation contributes to health and disease. The dataset containing the full genomic sequence of 1,700 individuals will be stored on Amazon's cloud computing unit, Amazon Web Services. 1000 Genomes

Tags: Big data, Information technology

BIOTECHNOLOGY

Microfluidic chip developed to stem flu outbreaks

Science Daily, 27MAR2012

About the size of a standard microscope slide, the integrated chip consists of a column at the top that extracts RNA from signature proteins in the sample associated with the influenza A virus; a middle chamber that converts the RNA into DNA; and a climate-controlled lower channel used to replicate the DNA in sufficient quantities so it can be detected by an external reader.

Tags: Biotechnology

COMMUNICATIONS TECHNOLOGY

Integrated silicon laser offers big efficiency jump

R&D Magazine, 28MAR2012

Researchers in Singapore have come up with a unique mirror design, known as a micro-loop mirror (MLM). Light emitted from one end of the laser is guided along the waveguide, around a narrow bend and is then directed back into the device. The MLM achieves a remarkable 98% reflection efficiency of light. The design has potential applications in high-speed and low-cost optical communications.

Tags: Communications technology, Optical communication

Physicists mix two lasers to create light at many frequencies

R&D Magazine, 28MAR2012

A team of physicists at the University of California at Santa Barbara has seen the light, and it comes in many different colors. By aiming high- and low-frequency laser beams at a semiconductor, the researchers caused electrons to be ripped from their cores, accelerated, and then smashed back into the cores they left behind. This recollision produced multiple frequencies of light simultaneously. The phenomenon has the potential to significantly increase the speed of data transfer and communication processes, the ability to send data down multiple channels, and high-speed modulation.

Tags: Communications technology, Optical communication

ENERGY

Researchers use electricity to generate alternative fuel

R&D Magazine, 30MAR2012

Researchers at UCLA genetically engineered a lithoautotrophic microorganism known as Ralstonia eutropha H16 to produce isobutanol and 3-methyl-1-butanol in an electrobioreactor using carbon dioxide as the sole carbon source and electricity as the sole energy input. The current way to store electricity is with lithium-ion batteries, in which the density is low, but when you store it in liquid fuel, the density could actually be very high. In addition, there is the potential to use electricity as transportation fuel without needing to change current infrastructure.

Tags: Energy, Alternate energy

GOVERNMENT S&T

Navy: We're 4 Years Away From Laser Guns on Ships (w/video)

Wired, 30MAR2012

The Navy thinks that maritime laser weapons finally represent a proven, mature technology. The key point came last April, when the Navy put a test laser firing a (relatively weak) 15-kilowatt beam aboard a decommissioned destroyer. Never before had a laser cannon at sea disabled an enemy vessel. But the Martime Laser Demonstrator cut through choppy California waters, an overcast sky and salty sea air to burn through the outboard engine of a moving motorboat a mile away.

Tags: Government S&T, Military technology

INFORMATION TECHNOLOGY

Computer scientists form mathematical formulation of the brain's neural networks

PhysOrg.com, 02APR2012

A team of researchers at the University of Massachusetts at Amherst show that when the "Super Turing" model is installed in an environment offering constant sensory stimuli like the real world, and when all stimulus-response pairs are considered over the machine's lifetime, the model yields an exponentially greater repertoire of behaviors than the classical computer or Turing model.

Tags: Information Technology, Mathematics, Neuroscience

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A computer screen you can fold

PhysOrg.com, 29MAR2012

The University of Toronto researchers have discovered a better way to make flat-panel displays that could one day lead to computer screens you roll up like a newspaper and wallpaper that lights your living room. VIDEO

Tags: Information technology

New search tool to unlock Wikipedia

KurzweilAI, 29MAR2012

Called Swipe ("searching Wikipedia by example"), the software aims to let users of the online encyclopedia answer complex questions that most search engines would stumble over. For example, trying to figure out "which actresses won academy awards when they were under 30 years old in the last 25 years?" becomes relatively simple when using the program. No knowledge of arcane database query languages is necessary, say the developers. It draws its answers from DBpedia, an expansive collection of 3.6 million data entries harvested from Wikipedia's pages.

Tags: Information Technology, Data processing

Featured Resource

Science Daily

Updated several times a day with breaking news and feature articles, seven days a week, the site covers discoveries in all fields of the physical, biological, earth and applied sciences from the world's leading universities and research organizations. RSS

MATERIALS SCIENCE

Shooting at ceramics

Fraunhofer Research, 02APR2012

Producing thin ceramic components has until now been a laborious and expensive process, as parts often get distorted during manufacture and have to be discarded as waste. Researchers are now able to reshape the surfaces of malformed components by bombarding them with tiny pellets.

Tags: Materials science

New understanding of how materials change when rapidly heated

EurekAlert, 29MAR2012

Researchers in UK were able to probe the behaviour of phase change memory materials, the semiconductors that store information in the next generation of electronics, as they were heated at rates up to 10,000 degree C per second. The results show that crystal growth rates are much faster than we previously believed in these materials and that the growth behaviour is independent of the surroundings. We now have a method of directly screening materials for improved memory performance; this means faster, smaller and less power hungry smart phones, ipods and computers are one step closer.

Tags: Materials science

ORNL process converts polyethylene into carbon fiber

EurekAlert, 27MAR2012

Using a combination of multi-component fiber spinning and their sulfonation technique, researchers at ORNL demonstrated that they can make polyethylene-base fibers with a customized surface contour and manipulate filament diameter down to the submicron scale. The process also allows them to tune the porosity, making the material potentially useful for filtration, catalysis and electrochemical energy harvesting.

Tags: Materials science, Government S&T

MEDICAL SCIENCES

Bacteria use chat to play the 'Prisoner's Dilemma' game in deciding their fate

EurekAlert, 27MAR2012

When faced with life-or-death situations, bacteria—and maybe even human cells—use an extremely sophisticated version of "game theory" to consider their options and decide upon the best course of action.

Tags: Medical Sciences, Biology, Science without borders

MICROELECTRONICS

MEMS Switches for Low-Power Logic

IEEE Spectrum, 01APR2012

These miniature moving switches—or nanorelays—aren't as speedy as the solid-state devices on today's chips. But what the tiny mechanical switches lack in speed they make up for in energy efficiency. Nanorelays don't leak current when they're off, and they can change states with just a fraction of the energy that's needed to turn a transistor on or off. These qualities make the microscopic switches ideal for ultralow-power chips that can run off scavenged energy from acoustic vibrations, light, or ambient radio signals.

Tags: Microelectronics

DARPA Seeks Integration of Diverse Microsystems Components on Silicon Chips

DARPA, 29MAR2012

DARPA anticipates bringing the compound semiconductor and silicon integrated circuit (IC) communities together for new ways to integrate components onto a single silicon wafer. Such convergence would enable foundry-style production of high-performance microsystems, leveraging today's silicon IC manufacturing base. Solicitation

Tags: Microelectronics, DARPA, Government S&T

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Researchers discover a new path for light through metal

Science Daily, 27MAR2012

Researchers from Purdue University have coaxed a thin film of titanium nitride into transporting plasmons, tiny electron excitations coupled to light that can direct and manipulate optical signals on the nanoscale. Titanium nitride's addition to the short list of surface-plasmon-supporting materials, formerly comprised only of metals, could point the way to a new class of optoelectronic devices with unprecedented speed and efficiency.

Tags: Microelectronics

PHOTONICS

HELIOS makes silicon breakthrough

EU R&D News , 29MAR2012

Researchers in the EU say the tuneable laser source integrated on silicon is a groundbreaking achievement in efforts to secure fully integrated transceivers. Silicon photonics have the potential to bring the large-scale manufacturing of complementary metal oxide-semiconductor (CMOS) to photonic devices that are not cheap because the technology is missing. Another challenge to silicon photonics is the lack of optical sources on silicon, the base material on CMOSs, according to the researchers.

Tags: Photonics, S&T EU

QUANTUM SCIENCE

New quantum encryption method foils hackers

Science Daily, 02APR2012

Scientists have found a new quantum encryption method to foil even the most sophisticated hackers. Researchers have come up with a simple solution to the untrusted device problem. Their method is called "Measurement Device Independent QKD." The aim is to detect subtle changes that occur when quantum data is manipulated by a third party.

Tags: Quantum science, Cryptology

Quantum information motion control is now improved

Science Daily, 02APR2012

Physicists have recently devised a new method for handling the effect of the interplay between vibrations and electrons on electronic transport. This study could have implications for quantum computers due to improvements in the transport of discrete amounts of information, known as qubits, that are encoded in electrons.

Tags: Quantum science

S&T POLICY

Navy's new robotics lab will speed technology to the total force

EurekAlert, 02APR2012

The $17.7 million LASR building opened its doors to researchers on March 16. As the nerve center for robotic systems research in the Department of Defense, LASR brings together scientists and engineers from diverse fields to solve the nation's autonomy challenges. Several multidisciplinary projects are already utilizing the lab's facilities to advance their research, including Damage Control for the 21st Century—a program to develop firefighting robots for use aboard Navy ships; Pectoral Fin Swimmer—an underwater robot; and hydrogen fuel cell propulsion to power a small unmanned aircraft called Ion Tiger.

Tags: S&T policy, Autonomous systems & robotics, Government S&T, R&D Funding

Japan, U.S., EU discuss rare earth supply security

R&D Magazine, 29MAR2012

China holds about a third of the world's rare earth reserves but supplies about 90% of what is consumed. In the past two years it has imposed limits on its exports, citing a need to impose order on an unruly domestic market and to reduce environmental damage. The U.S. has stepped up research on batteries, building materials and high-performance computers as part of the effort to find substitutes for some rare earths, while Japan and the EU are launching joint research this summer.

Tags: S&T policy, R&D Funding

SCIENCE WITHOUT BORDERS

Company develops conductive yarn for soldier uniforms

PhysOrg.com, 03APR2012

E-textiles have conductive material throughout the garment hence power can be routed through multiple channels. Thus if a portion of the material is cut or torn, power can still get to all of the pieces of equipment. And, for that same reason, the number of batteries can be cut down to just one, which means only one charge is necessary to run all of the equipment.

Tags: Science without borders, Military technology

Dutch 'flying car' takes to the skies (w/video)

PhysOrg.com, 03APR2012

The PAL-V is a gyrocopter that can fly as far as 500 kilometres (315 miles) at an altitude of up to 4,000 feet (1,200 metres). When it lands, it tucks away its rotor-blades and turns into a road-legal three-wheeled vehicle with a range of 1,200 kilometres. In development since 2008, the first commercial models of the arrow-shaped PAL-V are expected to go on sale in 2014 at 250,000-300,000 euros ($330,000-$400,000). The successful maiden flight of the PAL-V protoype was conducted at a Dutch Air Force base last month.

Tags: Science without borders

Getting to the moon on drops of fuel

Science Daily, 01APR2012

With their ionic motor, MicroThrust, EPFL scientists and their European partners are making this a reality and

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ushering in a new era of low-cost space exploration. The complete thruster weighs just a few hundred grams and is specifically designed to propel small (1-100 kg) satellites, it enables satellites to change orbit around Earth and even voyage to more distant destinations.

Tags: Science without borders, Micropropulsion, Space technology

STEM

From Beaker to Bits: Unique Collaboration Between Biologists and Computer Scientists Creates Computational Model of Human Tissue

Newswise, 02APR2012

Computer scientists and biologists at Rensselaer Polytechnic Institute have developed a rare collaboration between two very different fields to pick apart a fundamental roadblock to progress in modern medicine. Their unique partnership has uncovered a new computational model called "cell graphs" that links the structure of human tissue to its corresponding biological function. The tool is a promising step in the effort to bring the power of computational science together with traditional biology to the fight against human diseases such as cancer.

Tags: STEM

PhDs leave the ivory tower

Nature News, 02APR2012

Research funders and education authorities are reshaping the PhD programme to train students in non-science skills such as networking as well as research. One of the most radical expositions of this philosophy is unfolding in the United Kingdom. Instead of being trained individually in one academic's research group, they are being taught in cohorts in a doctoral training centre (DTC)—a university-based hub focusing on highly specific areas, such as chemical synthesis or nuclear fission. Some academics worry that the centre-based approach will squeeze blue-sky research out of PhD programmes—and deprive senior scientists of eager assistants.

Tags: STEM, S&T Policy

With Help from ARRA, Universities Report $61 Billion in FY 2010 Total R&D; New Details from Redesigned Survey

NSF News, 30MAR2012

University spending on research and development in all fields increased 6.9% between FY 2009 and FY 2010 to $61.2 billion, according to FY 2010 data from the NSF Higher Education Research and Development (HERD) Survey. When adjusted for inflation, higher education R&D rose by 6.0% in FY 2010. Full Report

Tags: STEM, R&D Funding ■

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